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An Exercise in Applied Geography

Geographical Planning in Urban Areas for the 1960 Census of Ghana

JOHN M. HUNTER

THE NEWLY-EMERGED,[1] independent nation of Ghana is under-developed but by no means impoverished. Wishing to accelerate its present rate of development it has launched an ambitious five-year plan;[2] but, before the full implementation of the plan can be achieved, accurate stock-taking in all sectors of the economy is necessary. Foremost, perhaps, is an inventory of the human resources.

The first official Census was held in 1891 and decennial counts followed in 1901, 1911, 1921 and 1931, the next and last being delayed until 1948 owing to World War II. The enumeration of 1891 related only to the area of the Gold Coast Colony, but coverage was extended to Ashanti in 1901 following the Yaa Asantewa War, as well as to the Northern Territories; and to the mandated area of Togoland in 1921 after World War I.

Traditional methods of counting were employed at first: grains of corn and cowrie shells representing males and females respectively would be placed in a receptacle, normally a calabash, by the head of the family and then conveyed by runner to the Chief who, in turn, would inform the District Commissioner. This method persisted in certain remote areas as late as 1921,[3] but was finally superseded by more accurate household and canvasser systems of enumeration.

Not unexpectedly a greater degree of accuracy has been claimed for each successive census although all such assessments were based on personal opinion and not on post-enumeration checks and a statistical evaluation of the quality of the Census data. For example, the 1901 Census Officer,[4] well aware that many of the returns were "unreliable" and, in certain instances, "almost impossible to believe", suggested corrections ranging from +7 per cent for the Accra District to +83 per cent for Axim. But his successor, the 1911 Census Officer, complained that the estimates and adjustments of previous years were "not only valueless but mischievous". At the same time, however, the Commissioner for the Western Province, a backward and difficult area, reporting on the progress of census operations, considered that his returns fell short of the actual population by not less than 20 per cent;

➤ Dr. Hunter is a lecturer in geography in the University College of Ghana. He is deeply indebted to Dr. B. Z. Gil, United Nations Census Expert in Ghana, for helpful advice and criticism; and to Mr. E. N. Omaboe, Deputy Acting Government Statistician, for advice and for permission to publish this account together with the specimen enumeration area maps, the first of which is based upon a 1 : 1250 sheet of the Survey of Ghana with the sanction of the Director. For a discussion of the nature of applied geography readers are referred to L. Dudley Stamp, "Applied Geography", chapter I in *London Essays in Geography*, L. D. Stamp and S. W. Wooldridge eds., London, 1951, and *Applied Geography* by the same author, Pelican Book, Harmondsworth, 1960.

whilst in the Eastern Province the Commissioner reported that "in the opinion of competent observers a large addition should be made to the figures obtained". Also in that year only about two-thirds of the population in the Northeast Province of the Northern Territories were enumerated, no census being taken in twenty-six villages "owing to the wildness of the inhabitants".

In 1921 the results were described with subtle, but unfortunately subjective, shades of meaning as "fairly accurate" in the Central Province where the best results were obtained and "very fairly accurate" in the Eastern Province where some villages were enumerated for the first time. The Chief Commissioner in Ashanti admitted that it was not possible to speak "with any great confidence" on the accuracy of the actual figures, and in the Western Province a 10 per cent error of under-enumeration was suggested.

In 1931 the majority of the Census Officers were of the opinion that the returns under-estimated the actual population by some 2–10 per cent. In 1948 the question of the relative accuracy of the returns was not discussed at any length, possibly the implication being that a satisfactorily high level of accuracy had been achieved, but the Census of that year suffered from lack of simultaneity[5] as well as from other weaknesses, and it cannot be regarded as a full national Census in the strictest sense of the term as currently defined by the United Nations Organization.[6] The next* Ghana Census, which will coincide with the 1960 World-Wide Census, aims to achieve the highest attainable standards of accuracy and to be as thoroughgoing as the country's resources will permit.[7]

Inaccuracies in census enumeration may stem from either physical or human difficulties. The latter category embraces the attitude and behaviour of the population at large and the quality of the personnel conducting the census. Personal qualities of a very high order are called for in census field personnel. Quite apart from the question of intelligence and integrity, enumerators need to be fired with sufficient enthusiasm to overcome the vast weight of misunderstanding, suspicion and apathy with which they are confronted. Training programmes, in which geographers participate, are designed to teach the necessary enumeration skills and to inculcate an awareness of responsibilities.

The difficulties arising from the attitude and behaviour of the population pose a problem of the first magnitude, for, notwithstanding the occasional counts of Paramount Chiefs in the past, the idea of a modern census is completely alien to the traditional way of life. In earlier official censuses, of course, this problem was even more acute; as, for example, when whole villages would be deserted at the approach of an enumerator,[8] or when fishermen took out to sea to avoid

* This article was written in December 1959 during the course of the Census preparations. The enumeration took place in March 1960 when a population of 6,690,730 (provisional figure) was recorded, as compared with 4,118,450 for the 1948 Census.

enumeration;[9] and even as late as 1948 certain groups of villages refused point-blank to allow counting to proceed.[10] Indicative perhaps of familiarity, as well as an increasing degree of sophistication, was the general attitude of the people in the Eastern Province towards the 1921 Census, described by the Commissioner as one of suspicion changing eventually to "contemptuous indifference".[11]

Earlier counts in certain areas were undoubtedly inflated by the Chiefs for prestige and other reasons,[12] but the overwhelming tendency was one of understatement, because rightly or wrongly, the census was indelibly associated with taxation and the imposition of governmental control. Such fears run deep and by and large this attitude still obtains today, although opposition necessarily takes on more subtle forms. Recent field tests have revealed the extent of such opposition: enumerators were confronted with suspicion, evasiveness and even deliberate prevarication. This is a problem common to all underdeveloped areas where the populations are still largely illiterate. The remedy must lie in an intensive propaganda campaign[13] using all available media, especially the vernaculars, in order to win popular support; coupled with the development of an efficient census organization in which provision is made for an exact and detailed mapping programme.

Physical obstacles to enumeration are still important. In the past intrepid census officers trekked long distances by canoe and hammock trail which today can be covered speedily by motor vehicle. Thick forest, rolling savannah and lack of access roads, however, still present difficulties, and a full day's march between settlements is by no means uncommon in the Northern Region. Furthermore, incomplete map coverage on a suitably detailed scale adds to the difficulties. Only about one-third of Ghana is covered on the 1 : 62,500 scale and even the 1 : 125,000 series leaves a quarter of the country uncovered. Survey lags farthest behind in the fast-expanding, acutely congested urban areas.

Given that the purpose of the forthcoming census is an exact enumeration of the social, demographic and economic characteristics of the population within the framework of the census schedule, it follows that the role of the geographer, in providing maps on which the enumeration will be based, is of considerable importance; and for the first time in Ghana a fully detailed mapping programme is being attempted. Much of the value of the census will depend upon the quality of the geographer's boundary selection and in the subsequent cartographic representation of those boundaries. In the ensuing discussion these two related aspects are considered only within the limited context of urban areas. Rural areas present different problems which call for different solutions.[14]

The most important census boundary is that of the enumeration area. An enumeration area (hereinafter designated E.A.) is the area in which a single enumerator collects statistics at the time of the census, and from one point of view it is simply a temporary organizational

arrangement. However, if an attempt is made to determine its boundaries according to the criteria discussed below, it may prove of permanent value when the census results become available for analysis and interpretation.

In selecting an E.A. a battery of criteria may be applied ranging from purely physical determinants to socio-economic considerations. Ideally one looks for maximum homogeneity within an E.A. and maximum heterogeneity between E.A.'s, but in practice a compromise solution may have to be reached. Homogeneity may be measured in terms of urban function and distinguishing economic and social characteristics. The possible range of functional zones is very wide (e.g. industrial, commercial, banking and finance, shopping, entertainment, military, educational, administrative, residential), but only in the largest towns is any marked degree of functional differentiation discernible. In the smaller towns areal specialization and functional differentiation have reached only the first stages of development.

As regards residential zones it is often possible to make a sub-division into classes according to the structure and condition of the dwelling-places varying from sound ferro-concrete structures at one end of the scale to dilapidated swish-huts* at the other end. Rateable values also provide a fairly sensitive index to the structural conditions of buildings and thus enable one to distinguish between various grades of residence. An additional criterion for residential zones is tribal origin. The degree to which immigrants congregate in distinct quarters or *zongos* according to tribal origin is a persistent social feature of town life in Ghana. There are, for example, Lagos (Yoruba) Zongos, Hausa Zongos and peripheral nucleations of other "foreigners" (i.e. non-local people). Classes of occupations, too, sometimes provide a supplementary key to E.A. mapping problems. Certain towns may have a fishermen's quarter or a butchers' quarter or a miners' zongo or an area where petty traders are dominant.

Frequent instances will arise of course where a physically distinct and nucleated, socially and economically homogeneous area may have to be subdivided into two or more E.A.'s simply because it is too big for one enumerator. In such areas the principle of maximum heterogeneity between E.A.'s would obviously not apply. Population size is an important E.A. determinant. It has been found[15] that, in the time allotted for the census count (two weeks), one enumerator will be able to enumerate approximately one thousand persons, and thus no E.A. should greatly exceed this figure, although it could contain an appreciably smaller number provided that it conformed sufficiently with other criteria. A problem arising here is how to estimate population size. One method is to take the number of registered electors in each sub-ward and, provided the age-structure of the population is known, calculate the probable total by the simple proportion method. But

* Huts of caked mud.

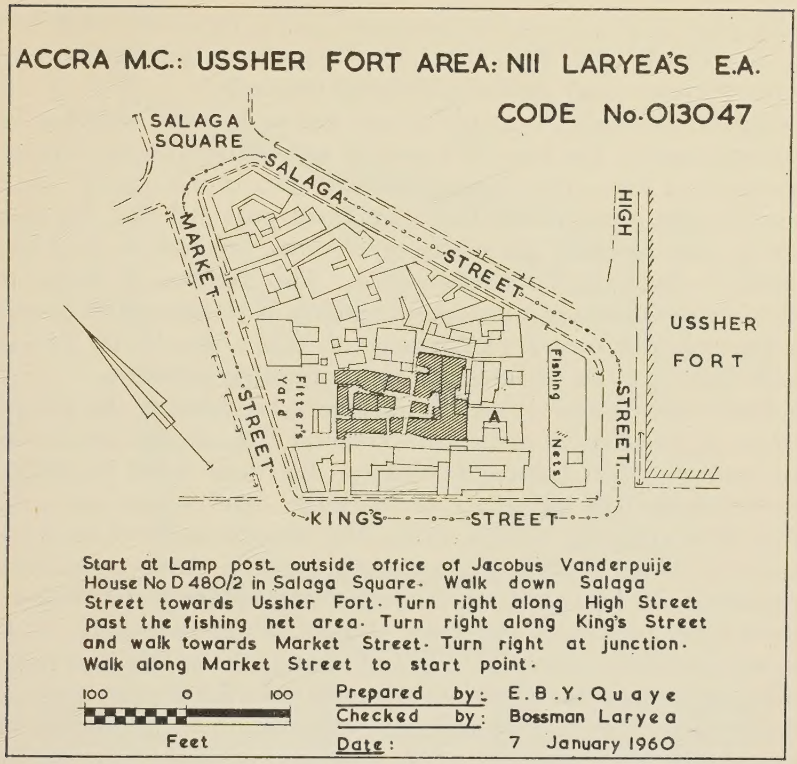


Fig. 1.—This E.A. lies in the oldest part of Accra near Ussher Fort on the sea-front. Its occupants are chiefly Ga fishermen, petty traders and labourers. An estimated 1050 persons live in an area of 2·479 acres (including road surfaces and open spaces) giving a density of 424 persons per acre. When one considers that very few of the houses exceed a single storey, the degree of overcrowding will be fully realized although even higher densities (e.g. 517 persons per acre) obtain under similar conditions elsewhere in the vicinity. Physically the E.A. is a maze of wooden and mud huts, roofed with corrugated iron, and shot through with narrow lanes and culs-de-sac. Indicative of the enumerator's problems in such a congested slum district is the small area cross-shaded on the map. A field-test showed that this cluster of buildings was in fact a single family compound containing no fewer than 205 inhabitants. Boundary description here presents no difficulties since the perimeter of the E.A. consists entirely of surfaced road. The E.A. takes its name from a prominent two-storey building, marked "A" on the map, occupied by a family well known in, and long associated with, the neighbourhood, whose ancestral head, Nii Laryea, was a distinguished Ga warrior. The scale of the original E.A. map is 1 : 1250.

errors arise because the age-structure of the population is imperfectly known and not all eligible persons register to vote. Such estimates should therefore be treated with caution. By far the best results are obtained in the field by ascertaining the average number of persons living in a typical household or compound and counting the total number of compounds in a proposed area.

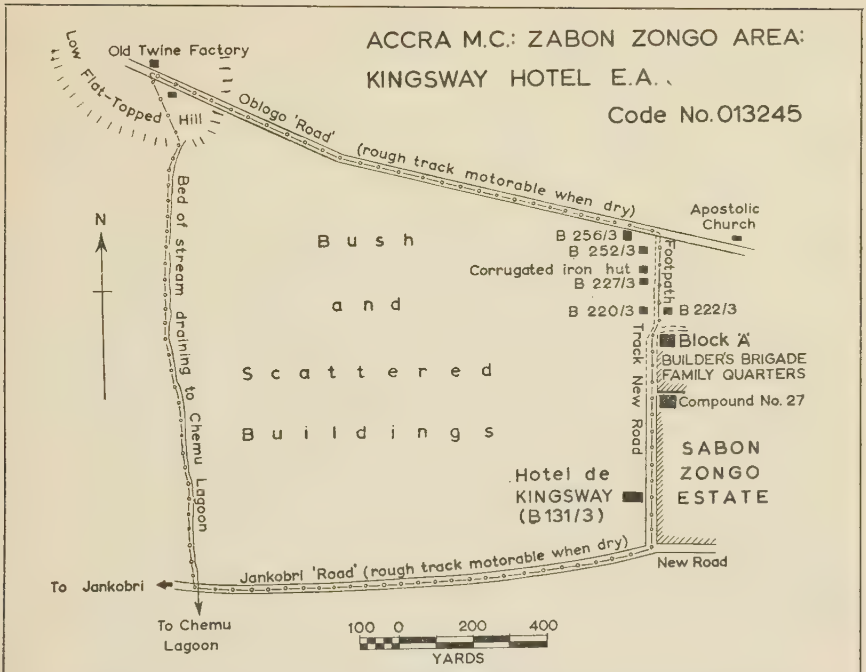
The precise nature of the boundary containing an E.A. is a matter of considerable importance. All such boundaries should be readily discernible on the ground and, in view of the regular incidence and essential continuity of census counts, permanent. Thus a surfaced

road is preferable to an unsurfaced one; and a motorable track better than a footpath. Railway lines form excellent boundaries, as do perennial streams and concrete drainage channels.

Other criteria in E.A. mapping are size and shape. Neither is of great importance. For example, an E.A. may range from an acre or so in a congested slum area to several square miles in the "bush". In the latter case size is not particularly significant provided that the enumerator is able to cover the whole of his area (on foot or by bicycle or motor vehicle) in the census period. The criterion of shape, too, should be subordinate to other considerations. However, where possible, interdigiting and undue elongations of E.A.'s should be avoided. Ideally E.A.'s should be compact and concentric in shape.

A final consideration is local government boundaries, the integrity of which is observed in principle. Thus no E.A. should cut across a municipal or urban council boundary. Electoral ward boundaries, however, need only be observed in those cases where no serious conflict of determining criteria arises. Not uncommonly one finds ward boundaries which seem to have been somewhat hastily improvised. For example, in the 1948 Census it was found in Accra that Ward G3 contained 886 persons as compared with 19,565 for Ward D3. In any case, ward boundaries are not fixed and immutable especially in rapidly growing areas; and therefore it is expected that the Census maps and statistics will provide both central and local government authorities with a firm basis for the replanning of electoral and administrative districts. Similarly it is highly probable that the present statutory town-planning zones will be modified in the light of the forthcoming census data.

Among the cartographic features of the completed E.A. map the following are probably the most important: (i) where possible each map is of a size convenient for handling with other census documents and (ii) is backed and made suitably robust for continual use in the field; (iii) orientation and (iv) linear scale (commonly 1 : 1250; 1 : 2500; or 1 : 5000) are indicated; (v) a distinctive name based upon a conspicuous feature in the locality is given (e.g. Accra Municipality; Nungua; Fetish E.A., Accra Municipality; Labadi; Middle School E.A.); (vi) in addition each map bears a unique six-digit national code number (the first three digits are fixed for each locality indicating the region, the district, and the local authority, respectively, whilst the last three digits are used to identify individual E.A.'s within the local authority. Thus 328014 indicates the (3) Ashanti Region (2) Bekwai District (8) Obuasi Urban Council: E.A. No. 014); (vii) the perimeter of the E.A. is clearly marked on the map together with supplementary information gathered in the field, particular attention being paid to critical turning-points in the boundary line; (viii) as a further check against errors of duplication or omission, a concise and unambiguous typewritten description of the E.A. boundary is mounted on the map;



Commence on new road in front of Hotel de Kingsway (B131/3). Walk northwards along road with Sabon Zongo Estate on right (outside E.A.). Pass to left of Compound No. 27 (outside E.A.). Proceed in same direction along rough track with Builders' Brigade Family Quarters on right (outside E.A.). Pass to left of Block 'A' (outside E.A.). Continue in same direction along footpath between B222/3 (on right outside E.A.) and B220/3 (on left inside E.A.). Continue past B227/3, an unnumbered corrugated iron hut and B252/3, all three buildings being within the E.A. Turn left along Oblogo track past B256/3 (on left within E.A.) to old twine factory (outside E.A.) on low, flat-topped hill. Descend hill to bed of stream draining into Chemu Lagoon. Follow stream-bed southwards to Jankobri track. Turn left along Jankobri track to south-west corner of Zabon Zongo Estate. Turn left and return to start point along new road.

Prepared by: C. KENNEDY *Checked by*: BOSSMAN LARYEA *Date*: 7 January 1960

Fig. 2.—The "mushroom" fringe of Accra is spreading rapidly outwards into the surrounding coastal savannahs, flanking a series of lagoons in the process. Special problems arise because of the lack of up-to-date and suitably detailed maps. For the western half of the area shown in Fig. 2 only a 1 : 62,500 map, devoid of settlement, is available; whilst for the eastern half of the area map coverage on the 1 : 1250 scale is largely out of date, owing to the great rapidity of urban growth which has preceded street lay-out and the provision of power, light and sewerage facilities. Accordingly the Field Assistant, working on a rough scale of 1 : 5000, did not attempt to plot the distribution of buildings within the E.A., but concentrated instead upon an exact demarcation of the boundary. Scale is given in yards for the convenience of pacing. The E.A. extends over some 311 acres and is estimated to contain between 900 and 1300 people (i.e. 3 to 4 persons per acre). The scale of the original E.A. map is 1 : 5000.

(ix) finally the name of the assistant who prepared the map in the field is appended so that queries calling for detailed knowledge of field conditions may be appropriately handled.

The organizational requirements of the census call for a series of maps in addition to those provided for the enumerators. Their purpose will be to help to co-ordinate administrative planning. Hence supervisors' maps are being drawn containing aggregates of 10–12 E.A.'s and district officers' master-plans showing groups of supervisors' areas.

The concluding task will be the delimitation of statistical areas in the towns. It is intended that the processing and tabulation of census data for urban areas will proceed at two levels. The first will be based upon the E.A. and will provide the basic demographic variables only, whilst the second will be based on the statistical area, comprising carefully selected aggregates of 5–8 E.A.'s, which will permit of more elaborate analysis and tabulation.

Ghana and indeed the whole of West Africa is in the throes of transition. The old order is giving way to the new. Traditional ways of life are fast disappearing; and among the many agencies at work affecting this transition that of urbanization is of paramount importance. Towns are meeting points, melting pots, always in the vanguard of change. Their mushroom growth in recent decades, and the changes of which that growth is both symptomatic and instrumental in causing, have attracted the attention of sociologists, demographers and students of government. But with few exceptions in the past they have been poorly served with statistical information. Perhaps it is not too much to hope that, given *inter alia* adequate geographical planning within the framework of a carefully conceived and executed census operation, a firm statistical basis will be provided for future investigations.

REFERENCES

[1] The former British Colony and Protectorate of the Gold Coast became a sovereign state within the Commonwealth assuming the title of Ghana on 6th March, 1957.

[2] *The Second Development Plan, 1959–64*, Government Printer, Accra, 1959.

[3] In the Tumu area of the Northern Territories, in 1921, beans, groundnuts and stones were used to represent men, women and children respectively.

[4] See separate reports of Gold Coast Census for 1891, 1901, 1911, 1921, 1931, and 1948.

[5] The count in Ashanti and The Colony was made on the average about three weeks later than in the Northern Territories.,

[6] *Statistical Papers*, Series M, No. 27, U.N.O., 1958, Section 102.

[7] For a full statement of statistical techniques and organizational procedures see: B. Z. Gil, "Demographic Statistics in Ghana", paper presented to the Seminar on African Demography, Paris, 20–26 August, 1959; and for a discussion of statistical problems see: E. N. Omaboe, "Counting the people in Ghana", *Economic Bulletin*, Accra, vol. 3, no. 2, February, 1959, and E. N. Omaboe, "Estimating the population in Ghana", *Economic Bulletin*, Accra, vol. 3, no. 3, March, 1959.

[8] Gold Coast Census Report, 1911.

[9] Gold Coast Census Report, 1921.

[10] Gold Coast Census Report, 1948.

[11] Gold Coast Census Report, 1921.

[12] Representation on Provincial Councils and the issue of gun-permits were made on a population basis.

[13] Such a campaign using, for example, a fleet of mobile-cinema vans has already been launched.

[14] A total of twenty-three towns are being mapped under the author's guidance for special tabulation purposes. They are the four municipalities: Accra, Sekondi-Takoradi, Kumasi and Cape Coast, the seventeen urban councils: Tarkwa-Abosso, Obuasi, Tamale, New Juaben, Effutu, Agona Swedru, Nsawam, Keta, Nyakrom-Nkum, Oda-Akim Swedru-Achiasi, Bibiani, Bekwai, Konongo-Odumasi, Sunyani, Berekum, Wa and Bawku, together with two towns of special status: Ho, a regional capital, and Tema, a development corporation area. The author's colleagues in the University College of Ghana, Dr. T. E. Hilton and Mr. E. A. Boateng, are engaged on census mapping in rural areas.

[15] See B. Z. Gil's "Report on the First Field Test", *1960 Population Census of Ghana*, Government Statistician's Office, Accra, December, 1959. Further experience, after the first Field Test, showed that the optimum E.A. size may range from 700 persons in remote rural areas with dispersed population and few facilities for travel to 1500 in compact urban E.A.'s.

Sociological Aspects of Population Mapping in Urban Areas

EMRYS JONES

IN A RECENT PAPER in *Geography*, A. J. Hunt and H. A. Moisley discussed some of the difficulties facing urban geographers dealing with population data and their mapping.[1] Here, I wish to extend the enquiry into methods of obtaining the most accurate picture of urban distributions, not only of population, but of all social data collected by the Registrar-General during a census.

The starting point is the same as that of Hunt and Moisley, namely the total inadequacy of published figures. Such elements as population density, religion, age-group structure, etc., of Belfast, for example, are published for wards only: and in that city of 450,000 people there are only 15 wards, the smallest of which has a population of over 10,000 and the largest over 51,000. In examining the social geography of such a large city, therefore, the geographer is at a very serious disadvantage. He would give anything for those detailed statistics so carefully guarded—and rightly so—by the Registrar-General to protect the anonymity of census returns and the privacy of the individual.

However, the data pass through an intermediate stage, the publication of which is prohibited by printing costs alone. Data from individual returns are grouped into enumeration districts (E.D.'s)[2]—i.e., areas conveniently covered by one census enumerator. When research projects have justified it the Registrar-General, both in London and in Northern Ireland, has made these E.D. figures available.

The first set of figures relating to E.D.'s, called "census tracts" by the Americans, was published by the U.S. Census Bureau in 1910 for the city of New York, and they have been used most extensively in Chicago, where their potentialities were also shown by the university's urban sociologists. Chicago published the first so-called *Local Community Fact Book* in 1938, and further volumes have been published based on the census of 1940 and 1950.[3] The basic assumption was the same as that pointed out by Hunt and Moisley, that the political divisions of a city were sociologically meaningless; Chicago is built up of a "mosaic of little worlds and an aggregate of local communities" which are never revealed by the published data. Sociologists have chosen 75 convenient units ("community areas") built up from census tracts, and census material is now regularly processed for these units. Each one, it is claimed, is fairly homogeneous, and is delimited by sharp

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breaks in the urban landscape and by social characteristics. Moreover, it is claimed that these areas "retain a certain constancy" from census to census. For these local community areas data are published on population, age/sex ratios, nativity, race, marital status, ethnic groups, education and citizenship. Such data are not only useful to local authorities and social workers, but provide basic material for research in urban ecology: their availability in this form has led to many of the major contributions of the Chicago school in this field.

The population of Oxford has been analysed for the 1951 census by similar areas which have been called "census tracts" by Dr. Mogey[4]. (The use of the term "census tract" in Oxford is confusing, because it does not correspond to the American census tract. The Oxford tracts were built up from E.D.'s, and therefore correspond to the American local community areas.) Oxford was divided into 35 geographical tracts, the limits of which were defined by a committee. "In settling the boundaries the aim has been to ensure that the population in each tract is as homogeneous in social and economic characteristics as possible while keeping the numbers large enough to protect the anonymity of the smallest group within it."[5] Furthermore, in Oxford the tracts were so defined that a number of them combined to make city wards; there were three tracts in some wards and as many as eight in others. This made possible comparative studies with some data collected by wards only.

Because the population was kept fairly constant within the tracts (approximately 2000) their extent varied greatly, from about $\frac{1}{6}$ sq. mile to over 2 sq. miles. It was also assumed, as in Chicago, that they will retain a certain constancy; and when the 1961 data become available the same units will be retained as far as practicable. With increasing population in the outer tracts some of these may need to be sub-divided.

Thus the pattern of society in Oxford has been clarified.[6] Not only is it more detailed, for we are dealing with 35 tracts compared with the former 7 wards, but the tracts themselves, within the limitations of their rather arbitrary boundaries, reflect previously determined social areas. The steps in the hierarchy of available data for Oxford are therefore as follows: E.D.'s (unpublished), tracts (published for the first time in 1957), wards (previously published) and city.

Data can be plotted by enumeration districts without combining these into a predetermined pattern of tracts, a method first used by Dr. Ruth Glass of Middlesbrough,[7] and extensively used in a study of Belfast by the author of this paper.[8]

The disadvantages of the E.D. for the social geographer are:—

(*a*) Its area is arbitrarily defined. It is merely a convenient number of streets to be dealt with by one enumerator.

(*b*) Because the population approximates to the same figure in all E.D.'s, districts vary considerably in extent. In the densely populated areas around a city centre they are small, and on the

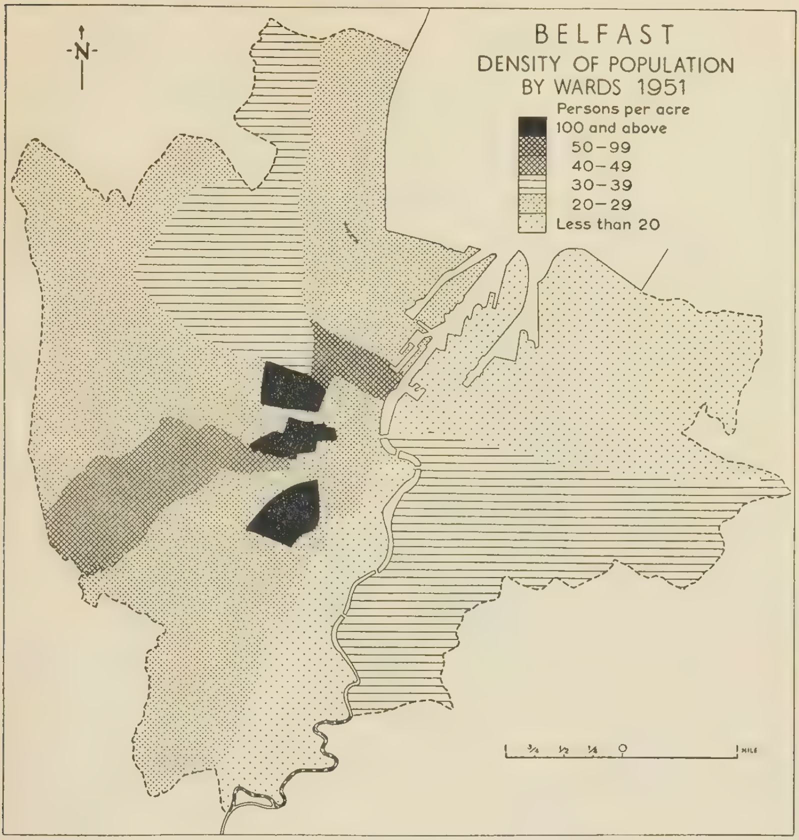

Fig. 1

fringes, where scattered suburbs mix with open countryside, they can be very large, in which case the mapping of densities, for example, is not usually satisfactory.

(*c*) E.D.'s may well overlap two easily recognized social regions.

The advantages are:—

(*a*) The numbers in the districts are fairly constant. The range in Belfast is considerable, but the interquartile range is 1538 to 2290, and the median is 1834. The approximate aim is 2000. This means that data by districts can be dealt with statistically with a fair reliance.

(*b*) Although large enough to satisfy the necessary anonymity of census work, the districts are small enough to be built up into larger social regions.

(*c*) In any large city there are enough E.D.'s to ensure a detailed pattern. In Belfast, for example, there are 231 districts. Compared with the results obtained from published sources which limit data to the 15 wards, this gives a very fine pattern.

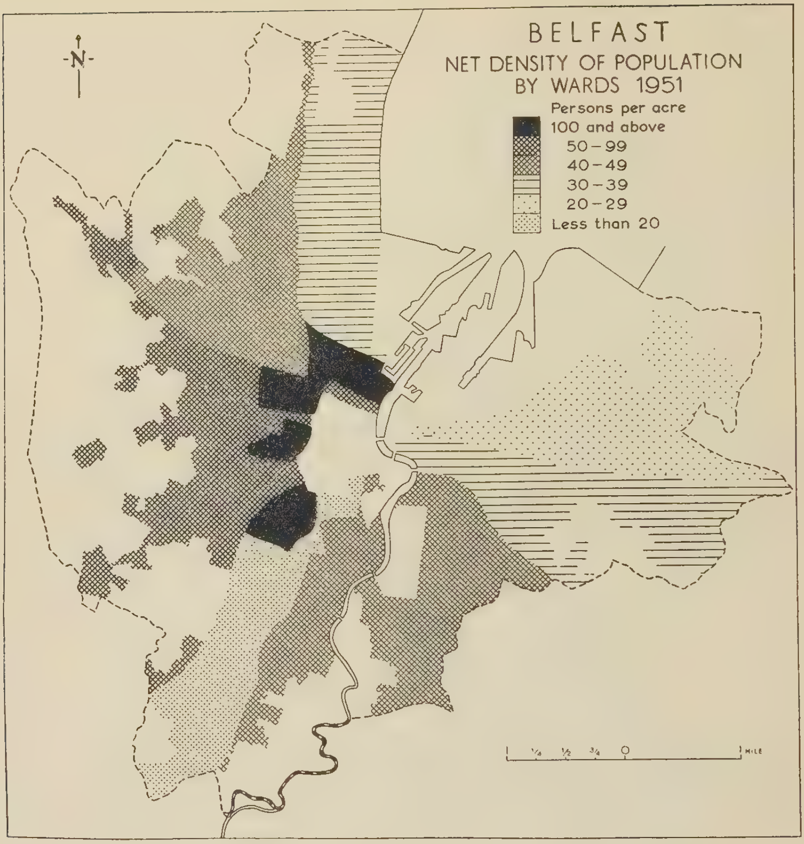

Fig. 2

To illustrate the usefulness of E.D.'s as mapping units, maps have been prepared of population density in Belfast in 1951. In the first map (Fig. 1) densities have been calculated as gross figures, i.e. in terms of the total areas of wards. They range from 15 persons per acre to nearly 160. The second map (Fig. 2) has been made more useful by calculating net densities, i.e. number of persons per acre of land used for houses, gardens and roads and service areas relating to the houses, and by shading the residential areas only. (The proportion of land in each E.D. restricted to purely residential use was calculated from large-scale maps, and followed a land-use survey of the city.) This is as far as published data will allow us to go. In Belfast this map does reveal a concentration of people around the city centre and in the industrial west, and the lighter densities of the residential north and south. Yet the slightest acquaintance with Belfast reveals the inadequacy of even the net density map. For instance, it is known that immediately to the east of the river Lagan, Ballymacarrett shares both the townscape and the demographic features of the industrial west:

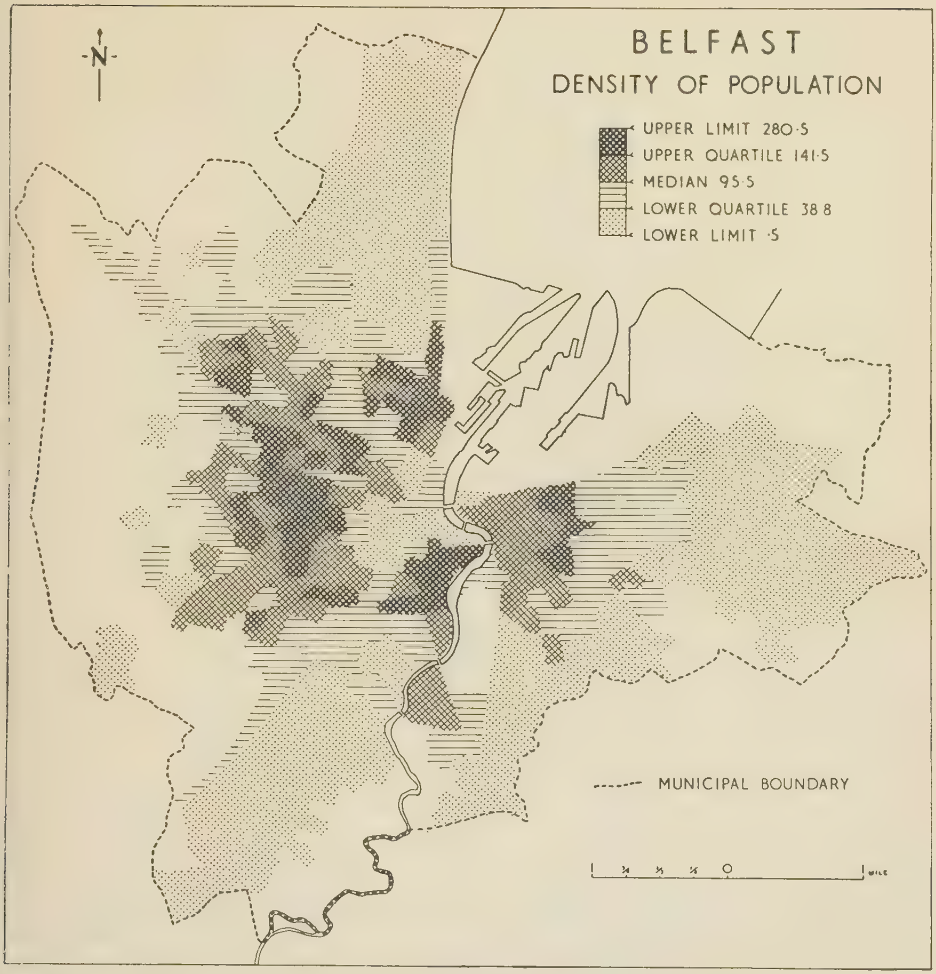

Fig. 3. (from E. Jones, *A Social Geography of Belfast*, O.U.P., 1960).

yet in the east published data are generalized over two wards which extend from crowded centre to residential fringe.

Compare this with the closer pattern given by E.D.'s (Fig. 3). The scale of densities was arrived at in this way. The densities of all the E.D.'s were arrayed in ascending order. The median (middle value) was found, as were the two quartiles (the quarter and three-quarter values). This gave four classes, in each of which were a quarter of the enumeration districts. A finer gradation could be easily obtained by dividing these classes into octiles (eighth values), which are particularly useful in emphasizing the extreme values—e.g. the distribution of the 29 districts with the greatest densities (above octile 7).

In this more detailed map, east Belfast is seen to be made up of an inner zone of high density (Ballymacarrett) not unlike the industrial

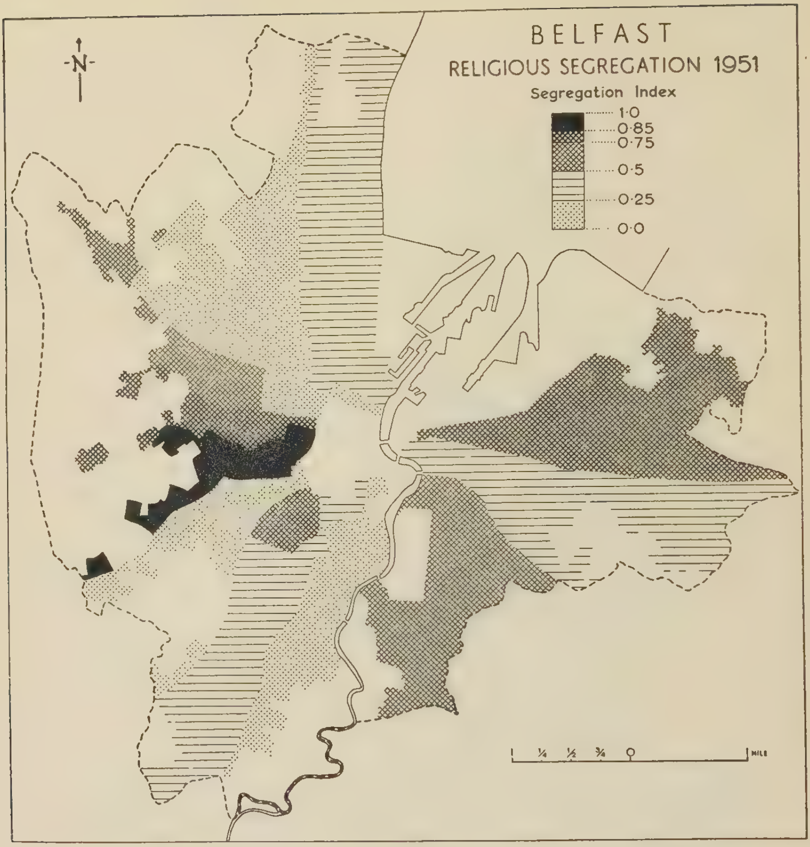

Fig. 4

west, grading gradually into an outer zone of light density typical of the purely residential areas.

One further example shows how social regions can be built up from enumeration districts. Fig. 4 shows the degree, by wards, of religious segregation, a subject which interests the social geographer as well as the sociologist because its distribution is often closely related both to townscape and to urban social patterns. A measure of segregation[9] is the degree to which the proportion of Roman Catholics (in this case) in any part of the city departs from the proportion in the entire city, the latter being the figure one would expect under conditions of random distribution—i.e. no segregation. Thus, in Belfast the proportion of Roman Catholics is 25·9 per cent, and if this proportion is found in any ward, then it can be said that in that ward there is no segregation (index 0). If the proportion of Roman Catholics in a ward is 0 per cent or 100 per cent, then segregation there would be complete and the index of complete segregation is 1. The map of ward indices, while substantiating certain broad generalizations, is utterly inadequate as a basis for further work. In east Belfast, again, all kinds of detail are

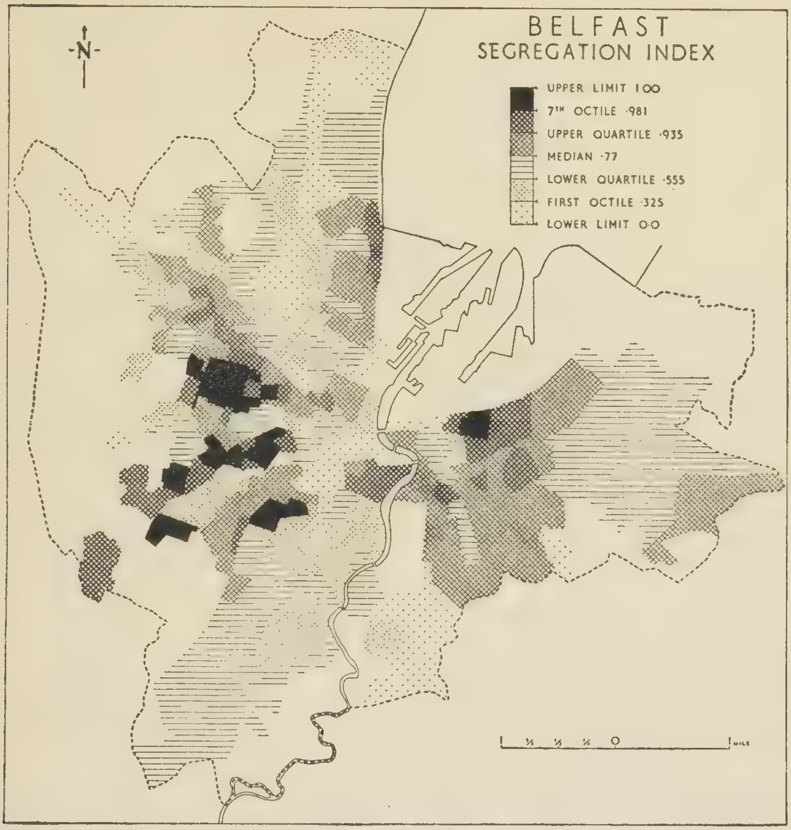

Fig. 5. (from E. H. Jones, *A Social Geography of Belfast*, O.U.P., 1960).

hidden because the ward boundaries cut across so many zones of varied social conditions.

But the breakdown revealed by the E.D.'s gives an accurate picture which even the most intimate knowledge of the city could only partially reveal (Fig. 5). East Belfast shows the kind of pattern hidden by the ward figures. Nor can we doubt that the mapping has revealed social regions which are homogeneous for this particular index.

The accuracy of the regions can in this instance be checked. Because the boundaries of the E.D.'s are arbitrarily chosen, there are times when an enumeration district overlaps two distinct social districts, thereby giving a false impression. For example, an E.D. might have 25·9 per cent Catholics and be classed as "no segregation", whereas that district might lie astride a sharp line of demarcation between Protestants and Roman Catholics, and itself have within it two mutually exclusive groups, the smaller Roman Catholic and the larger Protestant —in fact a district of very high segregation. This was checked in Belfast from a map of the distribution of Roman Catholic school populations by streets: and it was found that in half a dozen E.D.'s only

did misrepresentation of that kind take place. Moreover, all such districts were on the periphery of the regions of high segregation. Half a dozen anomalies do not upset the general pattern, and when they are known to be peripheral the amount of checking and correction in the field or by other data is small.

We can now compare the census tract method as used in Oxford with that of using E.D.'s. The kind of error I have just noted is shared by both, because the tracts are combinations of the E.D.'s and therefore contain their inaccuracies. The great advantage of the census tracts is that they lessen the number of units with which one has to deal. I think, however, that they have two disadvantages.

The first is this: that the social region has to be defined before the data are processed. In a big city this would be a formidable task. It assumes the very knowledge which our techniques set out to establish. Social geographers need to analyse the data in order to reveal social homogeneity. The E.D. is a convenient unit because it can be built up into social regions. I also think that the risks of predetermining social regions are increased because homogeneity must be assumed for so many elements in the structure of the community—density of population, social status, fertility, women in industry, etc. Homogeneous regions for these separate elements might differ radically, but this cannot be shown if the data for all the elements are collected for a set tract only. Using E.D.'s alone, different regions can be drawn for different elements in the social structure. Even the two elements illustrated here—population density and segregation—show patterns which differ fundamentally. Whether these can be superimposed to reveal more generally homogeneous social regions is a further step in analysis: I would be reluctant to assume such homogeneity unless extensive research had revealed it—and this, surely, is why we are searching for better methods of mapping statistical data.

Secondly, I think that the assumption that these tracts will serve for successive census data underestimates the degree of social change that occurs in a large city. And of all social data the element of change is probably the most important. The E.D.'s are so small, however, that they will reveal intercensal change, even if their boundaries change slightly.

For social geographers mapping by E.D.'s seems the better course and one which gives accuracy and scope. Our interest lies in an ecological approach, in studying social regions in their areal relationships and within the framework of the urban environment. For this, great detail may be necessary and, most of all, details of changes and movements have to be studied which have a bearing on urban structure.

Hunt and Moisley have shown how to fill a serious gap in the details of population distribution rapidly and effectively, methods which will

be most useful for short-term uses in planning. For long-term planning and academic research the time-lag involved in using census data may not be so great a difficulty, but the inadequacy of the data as they are now published is a serious limiting factor. One answer which could open up a new phase in social geography is the use of data for enumeration districts.

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The Pacific Tsunami of May 22nd, 1960

A. H. W. ROBINSON

THE EARTHQUAKE which affected southern Chile on the afternoon of May 22nd, 1960, was one of exceptional intensity. Even in Britain, over seven thousand miles from the epicentre, seismographs registered shocks of much greater amplitude than those caused by the earlier and nearer Agadir disturbance. The destruction on land, severe though it was in the Concepcion–Chiloe Island area, was only a prelude to a trail of havoc which in the next twenty-four hours was to affect the low-lying coastlands of the whole Pacific as far away as Japan and New Guinea. The main centre of the disturbance is believed to have been some distance offshore with the result that a large area of the sea-bed foundered along a line parallel to the Chilean coast. Although the vertical movement of the sea-bed was probably not more than a few metres the inrush of water which followed was sufficient to generate a series of long period waves which spread out in all directions and ultimately reached the farthest corners of the Pacific (Fig. 1). It was these seismically generated ocean waves which caused great damage and loss of life along coastlands as much as ten thousand miles away from the earthquake epicentre.

The Japanese word *tsunami* has now been generally adopted to describe this special type of ocean wave. By derivation the word means harbour wave and this implies that the seismically generated waves disturb even the quiescent waters of a protected harbour where normal wind waves are ineffective.[1] The characteristics of the tsunami are markedly different from those of the wind wave. Whereas the latter has a length from crest to crest measured in hundreds of feet, the wave length of the tsunami can attain a hundred miles. The velocity of the tsunami is also much greater, the series of waves traversing the ocean at speeds of up to 500 miles an hour. As the wave travels at a speed proportional to the square root of the depth of water to the ocean bottom, as given by the relationship $v=k\sqrt{(gd)}$ where v=velocity, d=depth, k=constant and g=acceleration due to gravity, there is a variation in the velocities of waves arriving on different coasts depending on the depth of water along the route taken by the wave.

On reaching shallow water the velocity and wave length of the tsunami rapidly diminish, but as the period remains unchanged there is a marked increase in wave height. Thus although the wave height of

➤ Dr. Robinson is a lecturer in geography in the University of Leicester. He is indebted to Dr. J. N. Carruthers and E. Privett of the National Institute of Oceanography for their assistance in obtaining source material while the paper was in preparation.

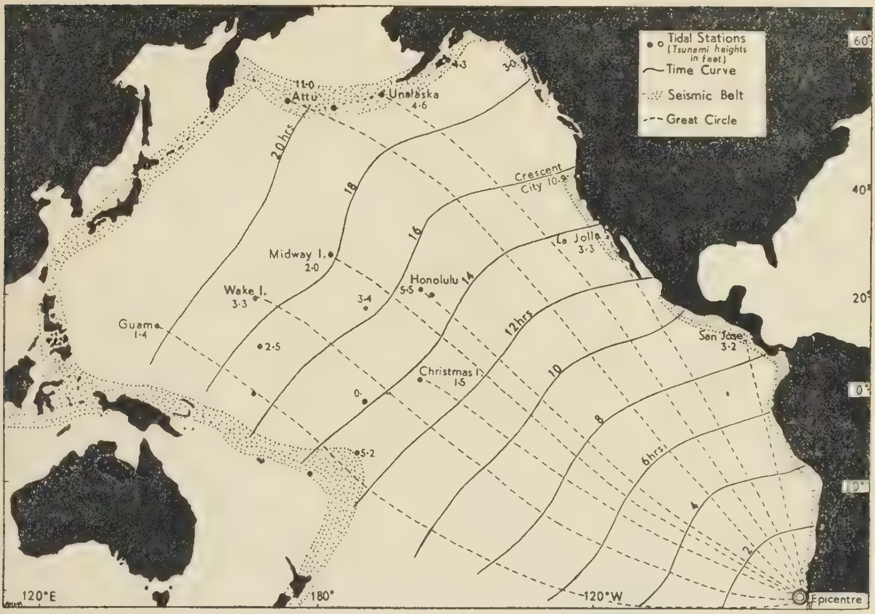

Fig. 1.—Isopleths showing time interval between earthquake (19 hr. 11 m. G.M.T., 22nd May, 1960) and the arrival of the initial wave of the tsunami. The maximum height of the tsunami is also given for various tidal stations. This map was prepared from data relating to the time of arrival of the initial wave supplied by the United States Coast and Geodetic Survey. The use of the Mercator projection has meant that the great circle courses, i.e. the shortest distance from the epicentre to the various stations, plot as a series of curves. By calculating the velocity of propagation of the wave it is possible to establish a time–distance relationship for each of the curves and to draw in the time-isopleths by interpolation. Allowance has been made for the variable latitudinal scale of the Mercator projection.

Calculated Velocities of the Tsunami from the Epicentre to Various Stations in the Pacific, 1960

Station	*Time Interval from Origin to Arrival of Initial Wave* hours	minutes	*Distance in Statute Miles*	*Velocity in Miles/Hour*
San José, Guatemala	9	24	3947	419
La Jolla, California	13	40	5807	425
Christmas I.	13	52	5984	432
Honolulu	15	22	6831	445
Midway I.	18	19	8142	444
Wake I.	18	22	8556	466
Unalaska, Aleutian Is.	19	39	8531	434
Attu, Aleutian Is.	20	19	9291	457
Guam	20	29	9439	460

the tsunami in deep water may be only 2 feet and therefore scarcely noticeable to ships at sea, on reaching the continental shelf or the submarine platform from which many Pacific islands rise, 20-foot waves may break on the shore. Tidal gauge data relating to the 1960 tsunami show a wave 11 feet above normal at Crescent City on the Californian coast. Less reliable evidence, mainly based on indirect

observations, suggests that waves of up to 30 feet in height swamped parts of the Japanese islands of Hokkaido and Honshu although on average the wave height was 12 to 15 feet above normal. In the south-west Pacific, Lyttleton Harbour in New Zealand experienced an 11-foot wave while Sydney also had what was described as "a freak tide". The time interval between successive waves varied from ten to twenty-five minutes with the onset of a really big wave heralded by a marked retreat of the sea.

Damage and loss of life resulting from the succession of waves which make up the tsunami were considerable in many of the low-lying coast-lands throughout the Pacific. Along the Chilean coast nearest the epicentre, huge waves broke on the shore in a matter of minutes after the disturbance and hundreds of people were drowned at Ancud in North Chiloe and at Puerto Montt. Some hours later the first of the series of waves reached the Hawaiian Islands. The easternmost island in the group suffered the greatest damage and parts of the town of Hilo were inundated and the waterfront damaged. The ground floors of the hotels on the famous Waikiki beach were also flooded to a depth of several feet. The Hawaiian Islands as a whole, however, were not so badly hit as during the 1946 tsunami when the epicentre was closer. Japan, as has been the case so often in the past, was to experience the worst effects of the waves. With the tsunami seldom exceeding 4 feet in Hawaii, it was assumed that the waves would hardly reach Japan, a most erroneous assumption as subsequent events proved. Although over ten thousand miles from the epicentre, waves with a height of 12 to 15 feet pounded the coasts of Hokkaido and Honshu and in places they reached an estimated height of 30 feet above normal. Many lives were lost because the authorities failed to give an advance warning of the approach of the tsunami, especially as it developed a magnitude much greater than was thought possible in view of the distance from the epicentre.

Several factors are responsible for causing the wide variation of wave height registered when a tsunami reaches a particular stretch of coast. Shepard and his co-workers made an extensive study of this aspect of tsunamis based on data gathered during the Hawaiian disaster of April, 1946.[2] The earthquake responsible on this occasion had its epicentre in the Aleutian Trench and thus the northern coastlands of the Hawaiian group recorded greater waves than the more sheltered southern coasts. As the disturbance was linear, the coast orientated parallel to this axis experienced the greatest waves. The character of the offshore topo-graphy also influenced the size of waves. Where the wave front advanced over a shallow sea-bed, bottom friction slowed its landward progress and caused an increase in wave height. The same front passing over deeper water gave rise to much smaller waves. Thus along a section of coast fronted by a succession of submarine valleys and ridges, there was a marked difference in the height of the waves reaching the shore. In

some cases a coral reef lying offshore acted as a natural breakwater, but Shepard found that there were many instances where the tsunami overrode the reef without any apparent loss of energy. The shape of the coastline of the various islands also appeared to be of some importance in relation to wave height. An almost circular island was less effective in refracting the waves than one with a crenulate coast. With so many diverse factors affecting the amplitude of the tsunami, it was not surprising to find that even adjacent stretches of coastline showed such a wide variation in the height reached by the waves.

A vivid description of what happens when a tsunami strikes an open coast has been given by Professor Shepard, who, in 1946, was on holiday at Kawela Bay in the Hawaiian island of Oahu when a series of waves broke on the shore fronting his bungalow.[3] Early on the morning of April 2nd, he was awakened by a loud hissing sound as though dozens of locomotives were letting off steam outside the house. Rushing to the window he was in time to see a mass of 'boiling' water surging over the low beach ridge and advancing towards him. Just when it looked as though the house was to be swamped, the water began to retreat as fast as it had risen. In a matter of minutes the coral reef was exposed indicative of a lowering of at least 20 feet. The low water conditions did not last long and soon the sea began to rise as the second wave came in. Sure in the belief that this wave would be less violent than the first, Shepard stood on top of the beach ridge to photograph its approach. He soon realized that the oncoming wave was even more powerful and only just in time did he manage to clamber to higher ground. From his vantage station he saw the front of his house smashed in. His previous notion that the initial wave would be the worst needed revision. With the prospect of even higher waves Shepard decided to make for the high ground of the main road from where he was able to watch several more waves roll in, each with a steep front. After a further six waves, each becoming progressively weaker, Shepard decided to return to the house, but as he approached another large wave surged over the beach ridge and he was forced to climb a tree for safety. Thereafter, although waves continued to come in at intervals of about fifteen minutes, their heights were smaller.

Professor Shepard's visual description of the arrival, timing and increasing height of the waves is confirmed by the observations made at selected tidal stations in the Pacific during the 1960 tsunami.[4] The tide gauge records show that the seismic sea waves were superimposed on the normal semi-diurnal tidal oscillation (Figs. 2 and 3). At Honolulu the initial wave had a height of about 2 feet above the normal expected level while the fourth rose to $5\frac{1}{2}$ feet and even the twelfth major wave had an amplitude of $4\frac{1}{2}$ feet. The tidal records also confirm that before the approach of a large wave there is a rapid lowering of sea-level which, on the surf beaches of the Pacific, gives a strange period of quiescence.

From the preliminary data available it is already clear that the 1960 tsunami ranks as one of the largest of the past century.

Unfortunately comparable data are not available for some of the stations which showed the biggest wave heights during 1960 nor are

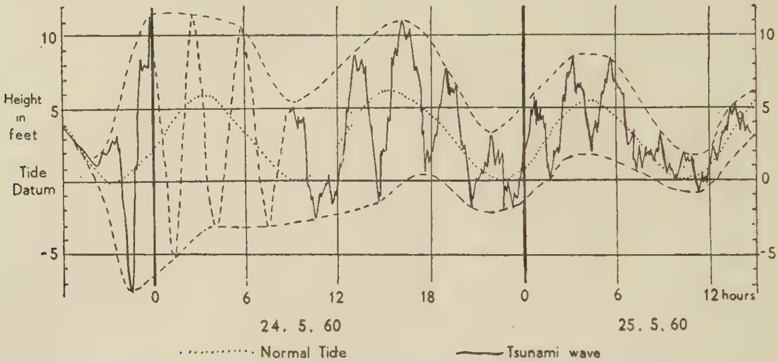

Fig. 2.—The tsunami as recorded at Lyttleton Harbour, New Zealand, superimposed on the normal tidal oscillation and showing the diminishing amplitude of the disturbance from its peak at midnight (local time) on 23rd–24th May, 1960. The broken line on the tsunami curve from 0 hours to 9 hours on 24th May is based on estimated wave heights.

they yet available for Japan where the waves were exceptionally severe. The indications are, however, that the Japanese figures will confirm that the 1960 tsunami was of major proportions.

The frequency of earthquake epicentres occurring in the zone of the Fiery Girdle has meant that the Pacific is particularly susceptible to tsunamis. No fewer than 270 have been listed by Heck as causing

Table II

Maximum Recorded Rise or Fall on Tide Gauges of Selected Stations during Recent Tsunami (in feet)

Station	1946	1952	1957	1960
Honolulu	4·1	4·4	3·2*	5·5*
Sitka, Alaska	2·6	1·5	2·6	3·0
Neah, Washington	1·2	1·5	1·0	2·4
Crescent City, California	5·9	6·8	4·3	1·9
San Francisco	1·7	3·5	1·7	2·9
Port Hueneme, California	5·5	4·7	3·5	8·8
Los Angeles	2·5	2·0	2·1	5·0
La Jolla, California	1·4	0·8	2·0	3·3
San Diego, California	1·2	2·3	1·5	4·6

* Gauge ran off scale.

damage between 279 B.C. and 1946.[5] One of the largest followed the well-known Krakatao explosion in Sundra Strait in August, 1883.[6] Waves estimated to be 100 feet high swept away the small town of Merak, 33 miles away, and carried the man-of-war *Berow* about two miles inland. The waves generated travelled across the Indian Ocean and in to the Atlantic and were recorded in the English Channel

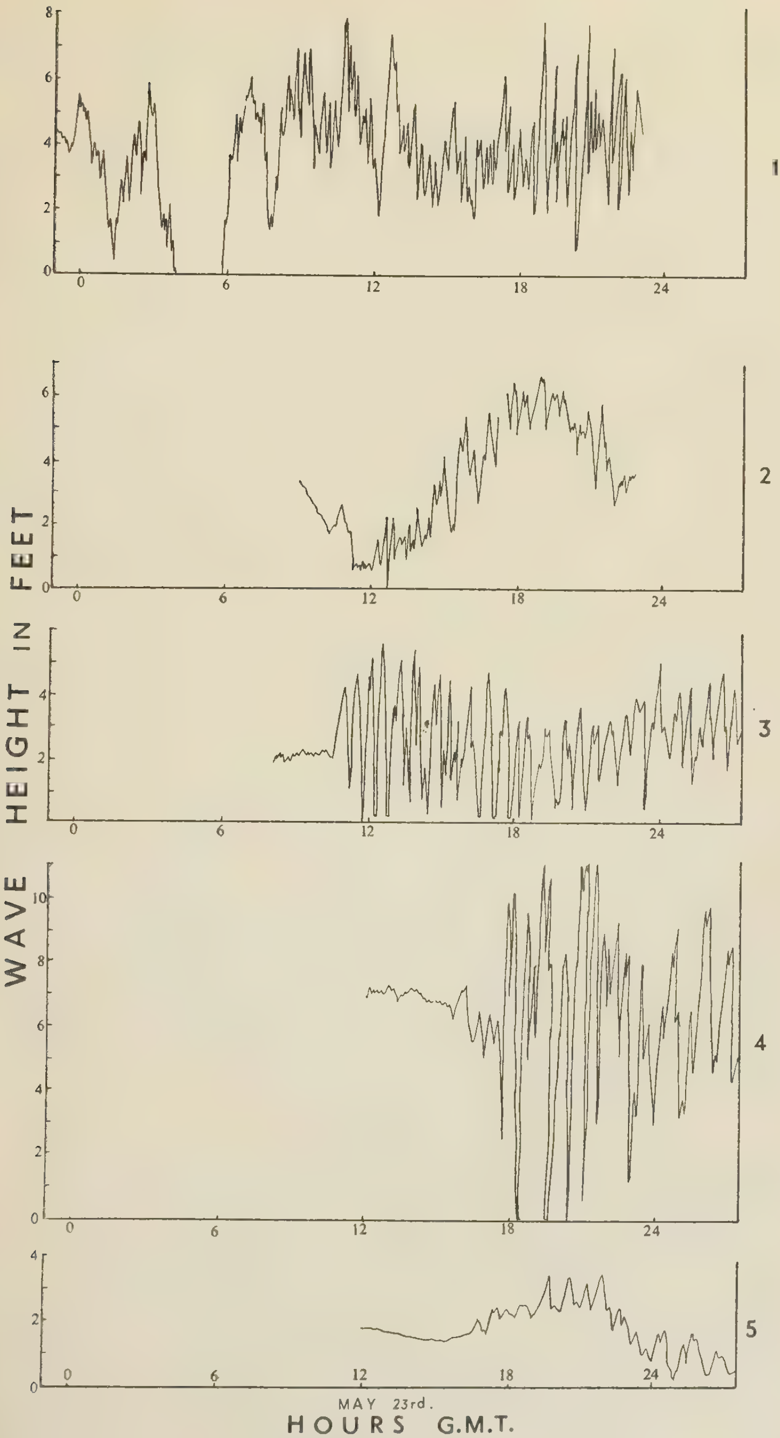

Fig. 3.—Tide gauge records of 23rd May, 1960, for (1) La Punta, Peru, (2) San Francisco, (3) Honolulu, (4) Attu Island, (5) Guam.

$32\frac{1}{2}$ hours after the initial explosion. Other tsunamis are not unknown in British waters, and following the Lisbon earthquake of 1761, anomalous waves 6 feet in height affected the Cornish coast.[7] Compared with the Pacific, Atlantic tsunamis are rare.

Following the havoc and loss of life which occurred during the 1946 Hawaiian tsunami, a network of stations was established covering the Pacific to give advance warning of future waves. The stations were of two types, seismographic to determine the position of the disturbance and tidal to record the advance of the wave systems. The Honolulu Magnetic Observatory of the United States Coast and Geodetic Survey was chosen to serve as the focal centre of the system. In the 1960 disturbance the epicentre of the Chilean earthquake was quickly located and within two hours an advance bulletin was issued indicating that a tsunami was expected in Hawaii within the next twelve hours. The system worked well for the Hawaiian Islands and the loss of life which occurred was due to people disregarding the warnings to seek higher ground. The Japanese islands of Honshu and Hokkaido were not so fortunate. The relative smallness of the waves recorded at the Hawaiian tidal stations was interpreted as indicating that they would hardly reach Japan and so no warning was sent out by the United States authorities in Hawaii. This unfortunate error of judgement emphasizes how little is known at present about the behaviour of tsunamis. Each disaster, although accompanied by loss of life, does give further data which can be used to minimize the effects of future occurrences. The main lesson to be learnt from the recent tsunami is that the long waves can travel vast distances without suffering any damping effects and so arrive on a coast ten thousand miles away with the same fundamental characteristics that were imparted to them at their source. It is the local conditions of aspect and offshore morphology at their destinations which largely determine the size of the waves breaking on the shore. When this is realized the apparent anomaly of a tsunami giving 20-foot waves ten thousand miles from the source compared with 5-foot waves on coasts only hundreds of miles from the epicentre can be understood.

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Correlation between Geographical Distributions

A Statistical Technique

J. G. CHADWICK

ONE OF THE MOST IMPORTANT ASPECTS of a geographer's work is the assessment of the connection or relationship between two or more features which are distributed over a landscape. Simple examples of this are the relationships between rainfall and types of agriculture, population and industry, a city and the distribution of a particular service or feature. The present paper is concerned with the development of a technique for the calculation, using statistical methods, of the actual correlation between two such distributions. It is based on normal mapping methods since the map is the basic tool of the geographer's trade.

Firstly, a completely general case will be considered in which two features "a" and "b" are distributed over a given area as shown in Fig. 1. The calculations which follow are rather laborious at first but only require a knowledge of simple arithmetic. The formulae used are common statistical formulae whose proofs are not given here.

The procedure is as follows:—

1. Place a grid of squares over the map on which the distributions are plotted. The size of the grid squares is not critical but will be discussed later.
2. Draw up a table as shown in Fig. 2. This consists, basically, of a number of vertical columns each corresponding to a group of a's, and a number of horizontal rows each corresponding to a group of b's. The values of these groups are shown along the top and left sides of the table respectively. In the present case, which was chosen arbitrarily, there are nine such groups. The numbers of a's and b's in each grid square on the map are counted and plotted by means of a dot in the correct squares on the table. It can now be seen that the size of the grid squares governs the range of "a" and "b" values used in the table. It is this factor which acts as a guide when deciding the size of grid squares, as a reasonable range of "a" and "b" values is required. The table, as described so far, is in fact a scattergram and from it the correlation can often be estimated.
3. It can be seen from Fig. 2 that a number of other columns and rows are added to the right of, and below the basic table. These are as follows, taking the horizontal rows first:—

▶ Mr. Chadwick is a master at Grange Park Secondary Technical School, St. Helens.

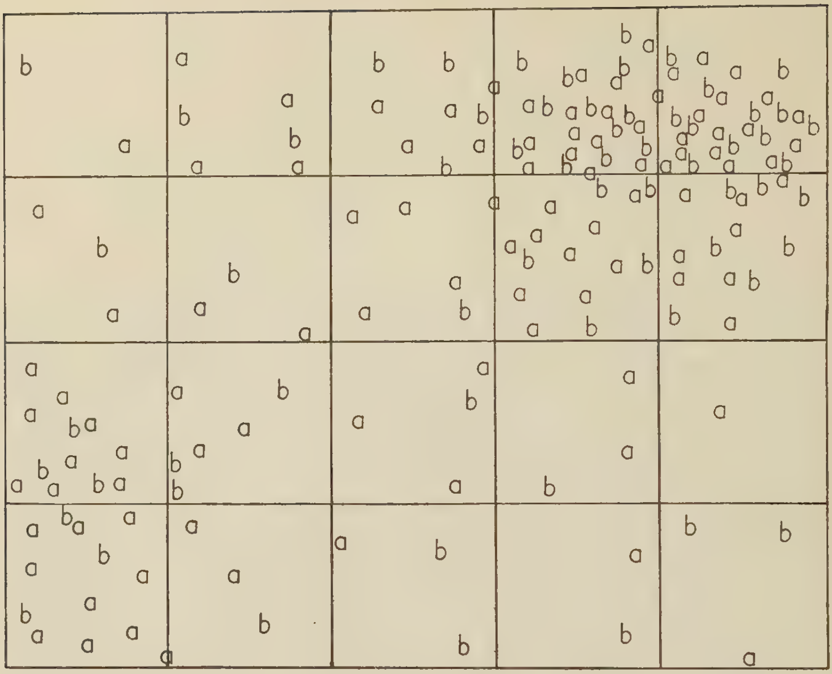

Fig. 1

(a) The first row, headed x, simply denotes a number in the range of +6 to −2 to each column. This range of values is obtained by noting the approximate "centre" of the distribution of dots in a horizontal direction, i.e. the column is found on either side of which there are approximately the same number of dots. It is virtually impossible to find a column which is an exact centre of a given distribution. The chosen column is then given the x value of 0. Minus values of x are given to columns to the left of this and positive values to the right.

(b) The second row is simply a count of the number of dots in the squares in each column. It is headed f, this letter standing for frequency. The numbers in the f row simply denote the frequency with which dots appear in each column.

(c) The third row is made up of the products of f and x and the fourth row is the products of f and x^2.

(d) The vertical columns, to the right of the table, are similar to those detailed in (a) to (c) above but refer to the horizontal rows and are thus lettered y, f, fy and fy^2 respectively. The fxy column on the extreme right is obtained by multiplying the x and y values for each dot and adding up these products along each row. The xy product is written in the bottom right corner of each square.

b \ a	0-1	2-3	4-5	6-7	8-9	10-11	12-13	14-15	16-17	y	f	fy	fy^2	fxy
16-17										7	0	0	0	0
14-15										6	0	0	0	0
12-13								• 25	• 30	5	2	10	50	55
10-11										4	0	0	0	0
8-9										3	0	0	0	0
6-7					• 4					2	1	2	4	4
4-5			• 0			• 3				1	2	2	2	3
2-3	•• 0	• 0	• 0		•• 0					0	6	0	0	0
0-1	••• 6	••••• 5	• 0							-1	9	-9	9	11
x	-2	-1	0	1	2	3	4	5	6		20	5	65	73
f	5	6	3	0	3	1	0	1	1	20				
fx	-10	-6	0	0	6	3	0	5	6	4				
fx^2	20	6	0	0	12	9	0	25	36	108				
fxy	6	5	0	0	4	3	0	25	30	73				

Fig. 2.—The bottom row is inserted as a check against the *fxy* column.

The figures have all been entered and calculated for the distribution shown in Fig. 1.

4. The correlation is now calculated as follows:—
N = the sum of all the frequency numbers
The Greek letter Σ is used to mean "the sum of all the . . . ."
Thus $N = \Sigma f$.

$$\text{Then} \quad \frac{\Sigma fx}{N} = \frac{4}{20} = .2 \qquad \text{and} \quad \frac{\Sigma fy}{N} = \frac{5}{20} = .25$$

$$\sigma x = \sqrt{\left[\frac{\Sigma fx^2}{N} - \left(\frac{\Sigma fx^2}{N}\right)\right]} = \sqrt{\left(\frac{108}{20} - .2^2\right)} = \sqrt{(5.36)} = 2.31$$

$$\sigma y = \sqrt{\left[\frac{\Sigma fy^2}{N} - \left(\frac{\Sigma fy^2}{N}\right)\right]} = \sqrt{\left(\frac{65}{20} - .25^2\right)} = \sqrt{(3.19)} = 1.79$$

(The Greek letter σ is used in statistics to refer to a quantity known as the standard deviation.)

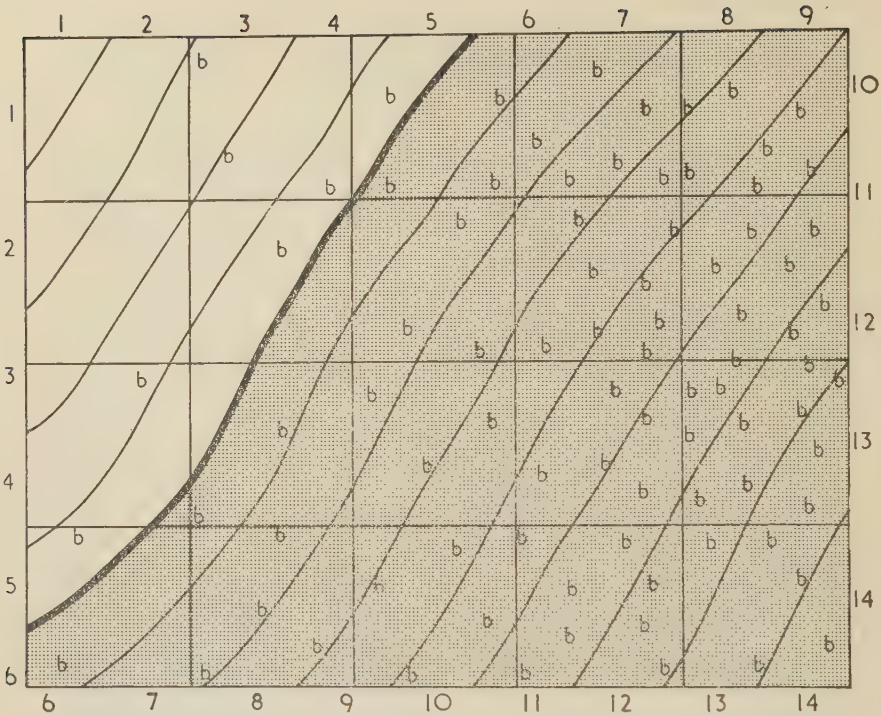

Fig. 3.—From this map "a" values are the totals of the numbers given to the dominant zones crossing each grid square; "b" values are the number of times the symbol **b** occurs in each grid square.

Now the coefficient of correlation r is found from the formula:—

$$r = \frac{(\Sigma fxy/N) - [(\Sigma fx/N).(\Sigma fy/N)]}{\sigma x \quad \sigma y}$$

$$= \frac{\frac{73}{20} - .25 \times .2}{2.31 \times 1.79} = \frac{3.6}{2.31 \times 1.79} = .87$$

It is now necessary to interpret what this figure actually means. The possible range of values of r is from $+1$ to -1. If $r = 1$ then the correlation is perfect. For the value $r = 0$ there is no correlation whatsoever. If $r = -1$ then one variable increases as the other decreases. In statistical work if a value of r greater than 0.4 is obtained, then the correlation is regarded as significant. If r has a value of 0.7 or more then the correlation is very high and the connection between the two distributions being considered must be very great. It must be remembered, however, that r is only a measure of correlation and does not imply any direct cause and effect relationship. Obviously in the present example "a" might affect some feature "c" which in turn affects "b", and thus correlation between "a" and "b" is high. This fact in itself does not reduce the usefulness of the measure of r, but it should always be kept in mind.

The basis of this method of analysis is the counting of the distribution of each feature in each grid square. This need not be done from a distribution map and can in many cases best be done in the field.

b \ a	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	y	f	fy	fy^2	fxy
11								• 21	7	1	7	49	21
10									6	0	0	0	0
9									5	0	0	0	0
8						• 4	•• 16		4	3	12	48	20
7								• 9	3	1	3	9	9
6							• 4		2	1	2	4	4
5					• 0		• 2	• 3	1	3	3	3	5
4			• 0			• 0	• 0		0	3	0	0	0
3					•• 0				-1	2	-2	2	0
2				•• 4					-2	2	-4	8	4
1				•• 6					-3	2	-6	18	6
0		•• 24							-4	2	-8	32	24
x	-4	-3	-2	-1	0	1	2	3		20	7	173	93
f	0	2	1	4	3	2	5	3	20				
fx	0	-6	-2	-4	0	2	10	9	9				
fx^2	0	18	4	4	0	2	20	27	75				

Fig. 4

Very often the geographer is concerned with the effect of some feature which cannot be counted, such as height or gradient or geological outcrop. In the case of height and gradient the mean value for the area enclosed by each grid square can be calculated from contours and used as the "a" values were in the example above. The problem of a geological outcrop is not quite so straightforward. In this case an assumption has to be made before the analysis can proceed. Firstly, it will be necessary to choose a region through which the boundary of the outcrop passes. It is then assumed that the effect of this outcrop on the features being considered will increase as one moves from the boundary towards the centre of the outcrop. Having made this assumption a number of regions, each equal in width, can be drawn parallel to the boundary. These can be numbered 1, 2, 3, etc., the number increasing towards

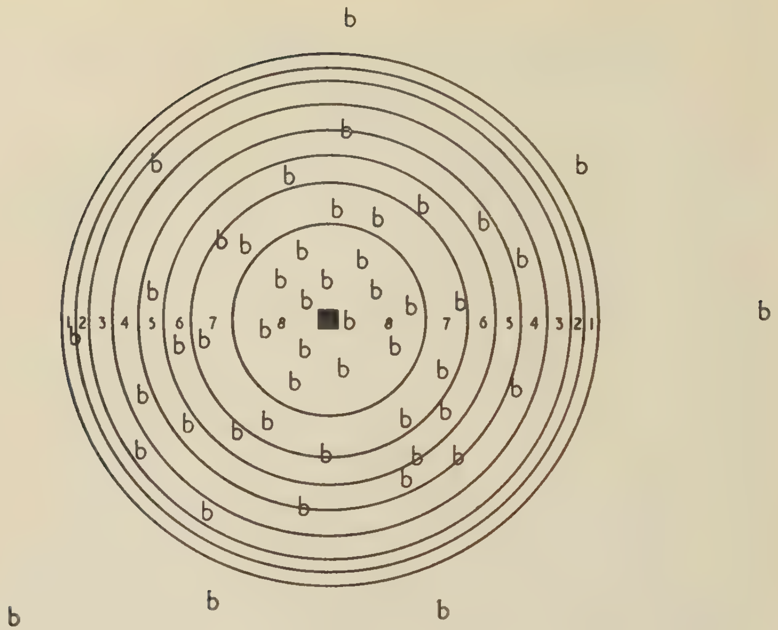

Fig. 5.—The square in the centre represents the town centre. The co-efficient of correlation is 0·89.

the centre of the outcrop. These numbers are used for the "a" values, in the grid squares, when calculating r as in the example above.

Fig. 3 shows a map across which runs a boundary between two different geological outcrops. Zones of equal width are drawn on both sides of the boundary and each one is numbered as shown. The distribution of some feature "b" is also marked on the map. In each square of the grid the number of b's are counted and the total of the numbers given to the zones found. These numbers are plotted in the table in Fig. 4 and the coefficient of correlation calculated. It is .85. It is evident from the map itself that there is a high correlation; the calculation measures and confirms this.

This method can be used in the study of towns where the correlation between a particular feature or service and the distance from the town centre can be measured as in Fig. 5. In this case as no grid squares of equal area are used, the area between the concentric circles must all be the same, using radii R, $R\sqrt{2}$, $R\sqrt{3}$, $R\sqrt{4}$, etc. progressively.

Another interesting application would be to measure the correlation between a feature as distributed over a landscape in historical times and a contemporary distribution. This would then be a measure of the extent to which a past landscape shows through to the present.

Some Anthropological Distributions in the British Isles

E. SUNDERLAND

GEOGRAPHERS ARE FAMILIAR, from the writings of Professor Fleure especially, with the study of racial types in the British Isles, based largely on such measurements as head length and head breadth among others. In recent years, anthropological surveys both in this country and in other parts of the world have tended towards the study of racial types as defined in terms of the genetical structure of populations, rather than in terms of the more conventional anthropometric data. In any such studies of race in the British Isles, it is necessary to place the information in a wider European, if not global perspective and it is also necessary to understand some of the techniques now extensively used by those who study the races of mankind.

The term "race" is currently defined by physical anthropologists in such terms as "A group of people who possess a number of inherited physical characteristics in common". It is therefore essential to know something of the underlying principles of human genetics.

Human beings, like other complex organisms, have bodies composed of a very large number of cells, each of which has a nucleus. Within each nucleus, in man, twenty-three pairs of chromosomes occur. Superficially, these are string- or worm-like structures, but they are in fact composed of a very large number of discrete particles called genes. It is these genes which control or determine the physical features and biological attributes which characterize individuals and also groups of individuals, or races. Thus these genes, inherited equally from both parents, determine such readily observable characteristics as the colour of one's hair and eyes, stature, the ability to taste certain innocuous chemical substances and so on. They also decide to which of a large number of blood groups one belongs. Yet again, the genes have an important role to fulfil in determining the shapes of one's bones and so of one's head, limbs and trunk. For some of these characteristics, environmental conditioning is also important. It is in terms of such inherited physical characteristics that race is defined.

The genetic mechanism for some physical characters is complicated, more especially when very many genes are involved in controlling the inheritance, as for instance in the case of stature and head shape. At present, therefore, the inheritance of those features is better understood where a few gene pairs only are involved. Classic examples of this are

➤ Dr. Sunderland, who is lecturer in anthropology in the Department of Geography of the Durham Colleges in the University of Durham, gave this paper as a lecture to the Association's Spring Conference at Durham on 20th April 1960.

afforded by the various blood-group systems; hence perhaps their importance in current race study.

The first discovered and perhaps the best known of the blood-group systems is the ABO series. Others include the Rhesus, MNS, Lewis, Lutheran, and Kell systems. These are, genetically, quite independent of each other. As the ABO system is the one that matters most, in a practical sense, in blood transfusions, much more information is available regarding it than is the case with most of the others. In addition, however, it is known that Europeans are unique in having very much higher percentages of Rhesus negative individuals than any other of the world's peoples. In fact, in much of the world, the Rhesus negative gene is either extremely rare or else completely non-existent. The world's highest frequency of Rhesus negative individuals (over 25 per cent) is found among the Basques. Much of northwest Europe has frequencies of 16–20 per cent and such values are characteristic of the British Isles. More detailed surveys may of course eventually demonstrate marked regional fluctuations in these islands, but the overall pattern of comparative uniformity seems clear. For the Rhesus gene C, the people of England, Scotland and Wales are similar in their percentages to the peoples of northwest Europe in general, with gene frequencies of 40–45 per cent. In Ireland, lower percentages (30–40) are characteristic. The MNS genes display little regional variation within the British Isles. At the moment, detailed regional data for the other blood-group systems are not available. Gradually, more gene frequencies are being calculated for many of the world's peoples and these will, it is hoped, indicate yet more clearly ethnic affinities and diversities, both in the British Isles and elsewhere.

In general, it may be said that among groups of people now occupying or until recently occupying distinct zones of the earth's surface, particular combinations of gene frequencies are found. The gene frequencies of all populations do of course change, gradually, by gene mutation, by natural selection and by random fluctuations in small groups of mankind geographically isolated, to quote only some of the mechanisms involved. However, the rates of change are low and thus the similarities of two groups of people originally living contiguously and later separated may persist for hundreds and even thousands of years. So it is that gene frequencies from the present populations may indicate the ethnic or racial affinities of the two groups, for example, negroes in the U.S.A. and Africa; Basques in Spain and Argentina. Such information is very useful in studies of human migration and population movements in general, and specific examples will be referred to later.

Consider the distribution of the ABO genes and the physical characters (the blood groups) which they determine, in northwest Europe and especially in the British Isles. Many data have been collected for the

ABO blood groups[1,2] all over the world and the information is very comprehensive for these islands. Combinations of any pair of a possible three genes, called for convenience A, B and O, determine one's ABO blood group.

The greater part of Europe is characterized by a population which has 25–30 per cent blood-group gene A. This is the frequency found also in England south of a line running from north Yorkshire to the Mersey and also in parts of south Wales (Fig. 1). Using this criterion alone, the people of these parts of the British Isles have close affinities with the large mass of the European peoples in general, as might be expected from historical and cultural evidence also. However, as one proceeds northwards and westwards from the delimited area, the percentage of A diminishes so that in north Wales and parts of south Wales, northern England, south and east Scotland, and southeast Ireland, the frequency of the A gene is 20–25 per cent. In the northwest Highlands of Scotland, much of Eire and parts of north Wales, the percentage is only 15–20. In parts of western Eire the percentage falls below 15. Similarly low frequencies (15–25 per cent) are found in west Normandy, among the Basques and in parts of the Mediterranean Basin.

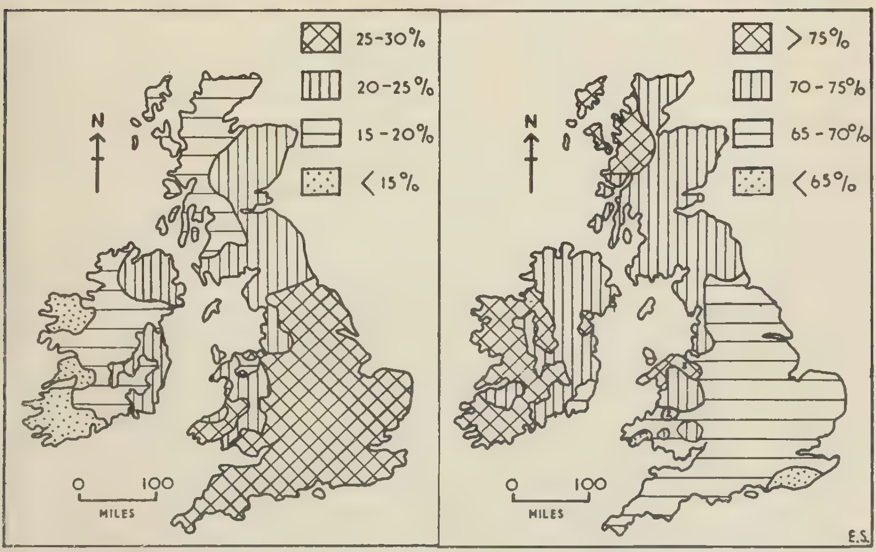

Fig. 1.—(*left*) "A" gene frequencies and (*right*) "O" gene frequencies in the British Isles.

The O gene is somewhat more irregularly distributed over much of western Europe, but large areas have figures of 60–70 per cent. These percentages again hold for most of England and for south Wales also (Fig. 1). However, in much of Scotland, northern England, eastern Ireland and much of north Wales, percentages of 70–75 are found, and percentages above 75 are found in northwest Scotland, western Eire and part of north Wales. Similarly high figures occur among the

Icelanders, the Basques, in part of northwest France (west Normandy), and in Sardinia.

The B blood-group gene occurs with frequencies of 5–10 per cent over all the British Isles, with a few exceptions. Such percentages are characteristic of much of northwest Europe, with the major exception of the Basques where the figure is considerably lower and where the B gene may be totally absent from the people of some areas. The Basques represent a long distinct population in Europe and have been conventionally called the Early European Race.[3] Very high B gene frequencies are found in central Asia, the percentages diminishing outwards from that centre. The westward decline is very clear, from 25–30 per cent north of the Caspian to 0–5 per cent on either side of the Pyrenees.

Thus, in terms of the ABO blood-group genes, the English and south Welsh are markedly similar both to one another and to contiguous European peoples. This major population has been termed, by Boyd,[4] the European or Caucasoid Race. His designation does not, of course, merely depend on the ABO distributions, but also on other blood-group systems.

However, as suggested already, most of the traditionally Celtic peoples of these islands display some significant departures from the figures characteristic of the main mass of the European population. The northern and western parts of the British Isles have collectively received different prehistoric peoples compared with Lowland Britain, as archaeological evidence suggests, and their historic development also has been distinct from that of the Lowland Zone. These early peoples in the Highland Zone have obviously contributed much to the genetic make-up of the present-day peoples in the north and west of the British Isles.

The identity of the peoples of the Highland Zone is amply demonstrated by the blood-group distributions, and the close similarity of blood-group gene percentages in Ireland, north Wales, Scotland, as well as Iceland, is very noticeable. The Icelandic figures are quite different from those of Norway, and it has been suggested that the majority of the Icelanders are derived from the northwest British Isles rather than from Norway, or Scandinavia in general. The first reliable accounts of Irish voyages to Iceland are found in the book of the Irish monk Dicuil, written in A.D. 825. It has been presumed from this account and others that then, and for some years previously, the only occupants of Iceland had been Irish hermits, and later, Irish settlements were established. The Norsemen probably obtained their knowledge of Iceland from the Irish. Of course, the Icelanders could be derived from a former Norwegian population, now ousted or partially replaced in Norway itself. This latter possibility is suggested by the historical evidence. With regard to Iceland, a document called the *Landnamabok* describes in detail the settlement of the island by

Scandinavians, and the partitioning of its land, from A.D. 874 to 930. The document names the homes of 1003 immigrants. Of these, 846 came from Norway and 126 from the British Isles. Of the latter, 52 were from Ireland and 31 from Scotland. Those from the British Isles were presumably Norse who had not occupied their new homes there long enough to lose their Norwegian identity. The Vikings who came from the British Isles brought with them Celtic-speaking slaves and concubines who formed a considerable community and who are mentioned frequently in the sagas. Some of the Viking leaders also had Irish mothers. It is the exact ratio of the Celtic peoples to the others that is still a matter of controversy. The blood-group evidence would suggest a fairly high proportion. Other, anthropometric, investigations and findings support this contention.

In Ulster, the effect of the large-scale English and Scottish plantations under James I[5] is clearly seen in the relatively high A gene frequency. In Northern Ireland, the blood-group frequencies of people with Irish and Scottish surnames are similar and resemble the general gene frequencies in both those countries. The frequencies among those with English surnames tend to match those of English people in northern England and the inhabitants of much of Scotland (especially the south); that is, the relatively high A gene frequency in Ulster is probably largely due to northern English and southern Scottish settlers.

In Eire, the O and A gene frequencies in east and west are statistically significantly different. A is lower and O is higher in the west. The gene frequencies in the east are much more like those in England. The regions in the east where A is higher and O is lower correspond almost exactly with the areas of intensive Anglo-Norman, Cromwellian and early Stuart settlement. It can be deduced from the gene frequencies that the present population of the eastern counties is a mixture of Anglo-Norman and later settlers with original inhabitants in approximately the ratio of 4 : 5. This appears to be reasonably in accord with historical evidence.

The present pattern of A, B and O gene frequencies in Ireland is primarily, it appears, the result of invasions and settlements that have occurred during the last 1200 or so years.

In Ireland also, the distribution patterns of the various anthropometric data are in general agreement with the patterns of the O and A gene frequencies. Professor Coon states that the tallest population lives along the western coast from Galway to Kerry; the shortest in the east, in the counties of Wicklow, Carlow and Dublin. The heaviest men live in the western counties—in Mayo, Galway, Roscommon and Kerry, averaging 160–161 pounds, compared with 153–154 pounds in the east from Louth to Carlow. The head breadth is greatest in the west as is facial width. On the whole, greater size and greater laterality are concentrated in the western counties from Mayo and Galway to Cork, with Kerry as the greatest centre; in Kerry, the cephalic index

rises to 80; in the eastern counties it falls to 78. Hair and eye colours also are darker in the west than in the east.[6] The inference is, according to Coon, that the maximum survival of the Mesolithic food-gathering populations is to be found in the west and southwest of Ireland, in the more mountainous, more rugged part of the country; on the other hand, the descendants of the later invaders, from Neolithic through Iron Age times onwards, are most concentrated on the more fertile land along the Irish Sea and on the Great Plain.

Serological data may bear out prior anthropological hypotheses, as was previously mentioned. Professor Fleure and other investigators[7, 8] have conducted extensive anthropometric investigations among Welshmen, and numerous series of measurements have been obtained in various parts of the Principality, excepting only some of the south Wales coalfield where the population is known to be very heterogeneous, if only because of recent immigration. In Wales, there is, for example, a preponderance of dark colouring in and around the interior plateau—the mountain moorlands. In many parts some three-quarters of the men have dark hair, compared with much lower figures—just over 50 per cent—in some coastal areas such as Gower. Many of these people, moreover, are comparatively short and have long heads. They have frequently been referred to as "Mediterranean" or "Iberian" types in Wales, the terms suggesting the regions of their prehistoric origins. On the whole, Wales, in accord with the mountainous character of the country and its general preservation of ancient cultural traits, is a region with strong local variability, which, in the anthropological sphere, manifests itself particularly, perhaps, in pigmentation.

For our immediate purpose, however, it is noteworthy that Professor Fleure in parts of the interior moorlands found "Extremely long headed brunets . . . with prominent brows, a median ridge on the skull, a rather large and prominent mouth, strongly marked temporal hollows, and, in a few cases, a rather swarthy skin". These people have been described as survivals of the Palaeolithic inhabitants of Wales. The type is sometimes called Brünn or even Cromagnon.[9] In the areas where this type exists, it has recently been shown that very high frequencies of blood-group gene B occur.[10, 11] The areas are:—

1. The Black Mountain of Carmarthenshire.
2. The Plynlymon Plateau of central Wales.
3. The Hiraethog Moorlands of Denbighshire. (Fig. 1.)

The B gene has a slightly, but significantly higher frequency in Scotland, Ireland and Wales, compared with England. However, in the three Welsh areas enumerated, the percentages are much higher still and are unique in western Europe. The B gene frequencies are 16·9 per cent, 13·8 per cent and 9·5 per cent respectively. These figures compare with a national average of 6–7 per cent.

Such high figures are, of course, characteristic of east European populations, but it is surely impossible to derive these western groups

from such distant sources. In this instance, the genetic similarity alone is insufficient indication of affinity in the absence of, for example, substantiating historical data. Hence, one must suppose these populations and their gene frequencies to have considerable localized antiquity. Random genetic drift (the Sewall Wright Effect), that is, random fluctuations in gene frequencies in small, comparatively isolated populations, may be the mechanism by means of which these genetically distinct groups were formed. Note that the Basques have very low B gene frequencies; the "pockets" in Wales have very high B gene frequencies. The considerable antiquity of both populations is undisputed but they must belong to two distinct strains of people.

The information available for the north of England is in accord with the more general material which has been outlined. That is, there is a north-to-south gradient in both the A and O frequencies. Dr. Fraser Roberts has shown[12] that it is possible to draw a single line from east to west across northern England, dividing the region into two parts, in such a way that the two areas are homogeneous within themselves and all the statistically significant heterogeneity lies between them. In drawing the line (Fig. 2), the major, though not the only consideration was the ratio of A to O, that is taking into account the diminishing of the former northwards and the increasing of the latter northwards. He states: "Starting in the west, it is perfectly clear where the line must be drawn right up to the densely populated Newcastle area. Western Cumberland with its industrial area lies north of the line."[13] This probably indicates old Celtic affinities—the gene frequencies persisting very much longer than, for example, a Celtic language. The Norse settlement in northwest England was very extensive. It overlay some earlier Anglian settlement, but it was chiefly a British or Celtic substratum on which it was superimposed. Much of this Scandinavian colonization occurred in the tenth century. Both Carlisle and Hexham lie north of the line while Penrith is to the south. The line turns northwards as it approaches Newcastle, but Consett lies to the north. The line then passes through the middle of the area of dense population on Tyneside. Newcastle itself lies south of a northwards bulge in the line, but the higher O/lower A region is very close to the western fringes of the city. It is noteworthy that the coastal area north of the Tyne, including Whitley Bay, North Shields and Tynemouth, shows high O, as do both Jarrow and Hebburn south of the river, together with Wallsend and adjacent areas to the north. Morpeth proved most anomalous, belonging with a high degree of statistical probability south of the line. Why this should be so is not clear.

Dr. Fraser Roberts has suggested that the north-to-south variations of both A and O frequencies are not a matter of gradual change, but that rather a number of distinct "steps" or abrupt changes occur along definite lines, one of which has been described. Another such line is thought to occur along the Humber–Aire (both Bradford and Leeds lie

north of such a line, however) and possibly (though more research is needed here) continued west of the Pennines, approximately along the Mersey valley. South of this line, which may well have in the past coincided with a region of difficulty, with swamps, etc., the English population is homogeneous regarding the ABO blood groups, and it is similar to the general European population. Between Aire and the Tyne (approximately) is another homogeneous population, and England north of the Tyne and southern Scotland together probably form another such homogeneous area.

Throughout northern England, the B gene frequencies show some marked local fluctuations, but without following any discernible overall pattern. Very few of these local "differences", if they may be so called, are real, that is, the local figures are not statistically significantly different from the surrounding population figures. This applies equally to the somewhat "higher" figures in the east and to one somewhat "lower" figure in the west.

In the British Isles one other characteristic for which some regional information is available is red hair. In this case, the problem is that of determining what shall be called "red". It is well known that individuals vary considerably in their estimations of what is "red" and what is "non-red" hair. Moreover, hair recently washed may appear very different in colour, compared with the same hair unwashed, and again, hair colours darken with age. Thus many variables enter into any survey of this characteristic. However, most of the surveys of hair colour in this country have relied on subjective assessment of hue by the anthropologist conducting the work. He would arbitrarily designate the colours as "black", "dark brown", "chestnut", "red" and so on. Comparisons of sets of data thus acquired are, therefore, of somewhat limited value, the so-called "differences" or "similarities" noted may be as much due to observational variance as to real dissimilarity or affinity.

However, using spectrophotometers—instruments which record the percentage of light reflected from a given surface (which can as well be hair as another substance) throughout the visible spectrum—objective assessments of colour are possible. The age factor can be minimized by taking samples from a relatively narrow age range and all hair specimens can of course be washed, before the reflectance curves are obtained.

A hair colour survey along these lines has been conducted,[14] the hair being obtained from newly recruited national servicemen, when much of their hair was removed in Army Barbers' Shops at the intake centres. The age range was of course very limited and standardized techniques were employed in handling the data.

The darkest hair was found in Wales, London and the Midlands; the fairest in East Anglia and Yorkshire. Again, previous findings are

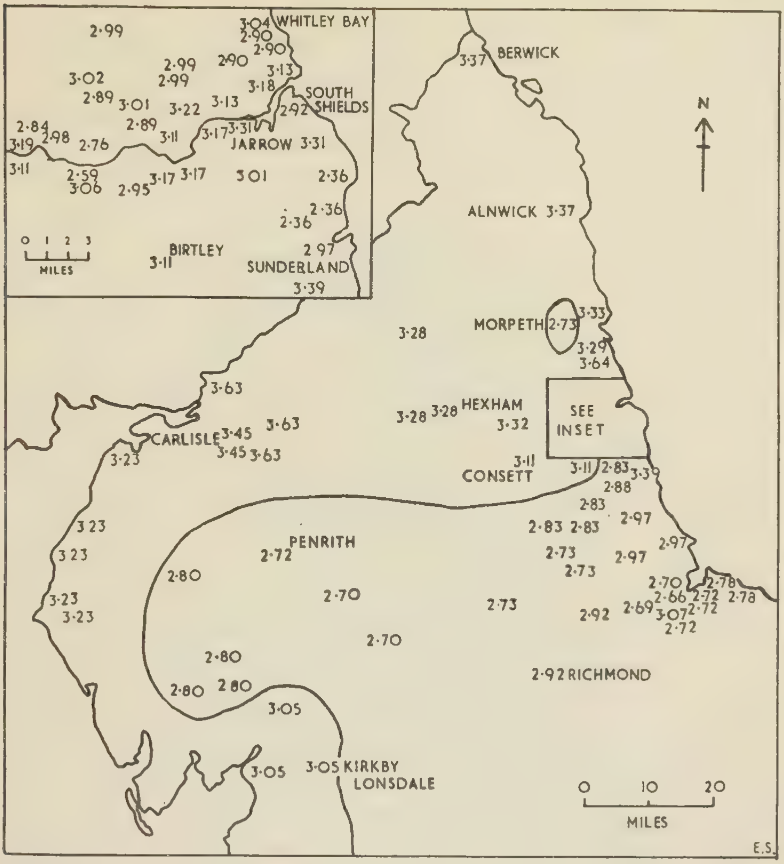

Fig. 2.—Northern England: ratio of O: A blood-group frequencies. Figures represent O/A values.

thus corroborated, but the new data are perhaps superior in their scientific objectivity.

Fig. 3 is based on a statistic called *R* which is calculated from the percentage reflectance curves. For individual hair specimens, values of *R* below 47 (approximately) denote redness. The value of *R* taken as the upper limit of redness can be lowered to, say, 46 and thus the statistic made more stringently selective and the percentages of red hair correspondingly reduced. High percentages of red hair, that is high percentages of persons with *R* values below 47 in the total population, are found in northern England, Wales, Scotland and in East Anglia. The data only refer to young adult males. The overall distribution may not be entirely novel but, as it is based on objective data, it too has much to commend it.

Conclusion

The method of using gene frequencies is completely objective, allowing only the qualification that the decision as to what boundary between

frequencies is to separate two races remains always man-made and somewhat arbitrary. The gene method is also quantitative rather than qualitative, so that the observed frequencies give us some idea, in a very precise sense, of how much races differ from each other, and, in addition, the consequences of race mixture can be accurately predicted.

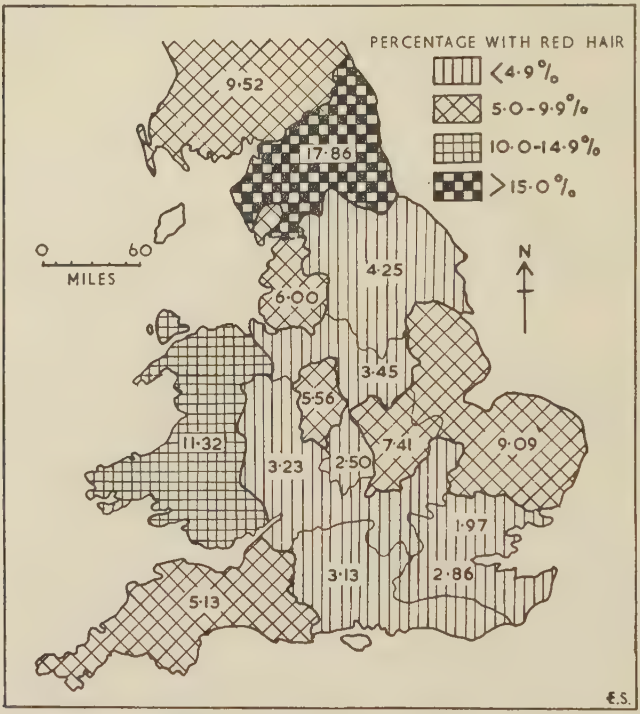

Fig. 3.—Red hair frequencies, based on *R* values below 47, denoting red hair.

Thus, using some gene frequencies currently available, one can say for the British Isles:

1. The population of England displays remarkable homogeneity, with the exception of the northern counties north of a fairly clearly defined east–west line. The south Welsh are seemingly part of the same major group, and the peoples of the supposedly Celtic southwest peninsula display no features which would serve to distinguish them from the remainder of the English population. Moreover, this major English group has close genetic affinities with the peoples of neighbouring parts of the European continent.
2. On the far northwest fringes of Europe, a different population exists, in Ireland, north Wales, and also in Scotland. This population is especially characterized by its high frequency of the blood-group gene O and the correspondingly low frequency of the blood-group gene A. The racial affinities of this northwestern population lie with the Icelanders especially, which suggests that

much of the Icelandic population is derived from the northwest British Isles. The typical blood-group pattern is also found, for example, in certain islands in the Mediterranean and also in parts of north Africa.

3. Within the northwest marginal area, local "pockets" of people occur, with very much higher percentages of blood-group gene B than those found in the surrounding areas. Over most of the British Isles, the B gene averages some 6–7 per cent of the total; in small parts of Wales especially, the figures exceed 10 and even 15 per cent. These localized groups of people are interpreted as having a considerable local antiquity, possibly dating as far back as Palaeolithic times.
4. The distribution patterns portrayed are in accord with and corroborate prior, or pre-genetic anthropological findings and are in general agreement with archaeological and other, cultural, information. This is perhaps especially clear in Ireland.
5. The major advantage of the new, genetic method of delimiting racial groups is its scientific objectivity. It has no undertones of inferiority, superiority, emotionally based race prejudice and so on, and its subject-matter continually expands as more and more genetic information accumulates.

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Maps and Map Work in the Primary School

E. O. GIFFARD

FOR MANY YEARS PAST there has been controversy about the ability of ordinary children under the age of eleven to understand cartographic symbolism and, despite much that has been said and written to the contrary, there are many who still believe that it is unprofitable if not impossible to teach children in the primary school how to understand contouring. The object of this article is to re-state the case against this belief and to assert that the majority of children between the ages of nine and eleven *can* be taught to understand most of the symbols on orthodox maps (including simple contours) and can be brought to comprehend the fact that very small portions of the curved surface of the earth may be fairly well represented on flat pieces of paper.

Ordnance Maps on scales of 25 inches and 6 inches to the mile are now being used in a number of primary schools but against this encouraging fact must be set the very large and still increasing demand from these schools (and even from secondary modern schools) for maps and atlases of pictorial nature. In such publications there continues to be a preference for graphic relief rather than contouring. The size of the demand clearly suggests that the orthodox map is considered to be beyond the comprehension of a very large number of pupils; too large a number to represent only genuinely backward or handicapped children.

The foregoing should not be taken to mean that teachers are wrong in demanding pictures or that graphic relief is something to be shunned. Well-chosen pictures can do much to stimulate children's interest in maps and if, for economic reasons, pictures have to be included within the covers of an atlas, it is better to have them provided that way than not at all. *So long as the pictures are not made part of the maps and are not used as substitutes for symbols* their presence within the covers of an atlas ought not to be opposed even by purists. Likewise with graphic relief; it would be quite wrong not to admit that this technique can play an extremely helpful part in the geographical education of children of all ages. So long as it is not used as a means of escaping from teaching contouring there is much to be said in its favour, particularly when used for physical wall maps of large areas mapped on small scales. It is, however, desired to press home the point that a map is a particular device invented and developed to represent *by means of*

➤ Mr. Giffard is Educational Adviser to George Philip and Son Ltd.

symbols that which cannot be nearly as accurately shown pictorially. Therefore the map and the picture should always be separate things even if used in conjunction with each other. To produce and to try to use something which is part-map and part-picture is to take a big step backwards; whilst to introduce such a hybrid to the pupil is to retard rather than advance understanding of a proper map.

The quite prevalent idea that it is specially difficult for children to understand the symbols used on maps is surprising when one remembers that the understanding of symbols involves no more than the association of ideas; a process commenced by every mentally healthy human creature not long after birth. In its earliest manifested forms this process approximates closely to what the physiologists call the "conditioned response" and may be said not to involve conscious thinking but, nevertheless, it very soon develops into a simple form of thinking and thereafter becomes one of the processes of learning. When the baby sees its special feeding bottle or plate a complicated series of mental and physical reactions takes place. Whether these amount to no more than what takes place when the dog sees its dinner plate depends upon the age of the baby but in both cases what takes place is the beginning of the association of ideas and, in that way, the beginning of the understanding of symbols. The point which it is desired to make is that a process which develops so early in life and which is so fundamentally a part of natural growth and development cannot, in the nature of things, be a process which only exceptionally equipped children may be expected to carry out. On the contrary, it is a process set in operation by Nature at such an early stage in the life of every ordinary child that it should be (and is) one of the easiest forms of learning. There can be, therefore, absolutely no justification for the idea that to ask young children to understand the symbols used on maps is to put a severe strain upon their minds. In fact it puts little or no greater strain upon them than to ask them to accept a block of wood as representing a motor-bus or three blocks of wood tied together as representing a train. As everyone knows, if left to themselves, children will often do some such thing without the suggestion being made.

By and large, children are very co-operative and obliging when they are being taught so long, of course, as their interest is maintained. In order to make progress with the matter in hand (be it game or lesson) they will readily accept many unexplained things as facts and are usually quite prepared to accept a variety of devices (including symbols) to further a project. If, for instance, one gives a small child a lump of wood and says "Let's call this a motor-bus," the child will agree without hesitation. It knows that the lump of wood is not a motor-bus but, for the purpose to be served, it is ready to accept the lump of wood as a symbol. At a later stage mounting interest and enthusiasm plus the near magic of imagination will transform that piece of wood so that, to all intents and purposes, it is a motor-bus as

far as the child is concerned *at that moment*. The same block of wood, seen by the same child later on when the game is over, will be recognized as being no more than it is. Not being required any longer as a symbol it has become once more just a block of wood. Likewise one may say to a child "Let's call this piece of paper the garden." Initially this may be a more difficult idea to put over but, by calling into play the same forces of interest and imagination, it will usually be possible to induce the child to accept the piece of paper as representing the garden, particularly if an initial demonstration be followed by an invitation to the child actively to co-operate in the development of the idea. One draws the garden path and the borders of the flower beds and then, being satisfied that one has gained the interest of the child, one invites it to mark on the paper the position of the apple trees. Momentarily the child is at a loss. "How?" comes the question. One invents and suggests a simple symbol and the child makes the necessary marks. With further encouragement more marks are made upon the paper until most of the essential features of the garden have been represented. Difficulty, however, arises with the chicken house. The child attempts a drawing but is justifiably dissatisfied and shows signs of becoming disheartened. Loss of interest is palpably imminent. "Let's just draw a square and call it the chicken house" one suggests. Relieved by the solution of the difficulty, the child draws the square and follows up this success by drawing a smaller square to represent the dog kennel. Soon the piece of paper has been covered by symbols and the child has made its first map! That will be enough not only for the day but, perhaps, for several weeks. Then another opportunity will arise and the experiment can be carried a stage further. Gradually the child can be taught to use the more common conventional signs and before long it will be possible to attempt little maps of small areas outside the garden or the school grounds.

Before serious map-making is attempted it will be necessary to tackle the problem of scale and most teachers find it wise to deal with this in the classroom at the outset rather than out-of-doors. In the classroom one can deal with scales of inches to feet and practical demonstration and experiment present no difficulties such as arise on uneven ground and with larger areas out-of-doors. The playground is the next experimental area and, by the time that little maps have been made of the playground, most pupils will have mastered the principle of scale. Oddly enough, in the later stages of practical work with map scales, it is the arithmetical computations which often present more difficulty than the understanding of principles.

The reason for describing how a child may be introduced to simple map-making and the use of symbols lies in the necessity to counter the idea that there is something so specially difficult about this that it is better to find other and easier ways by which to start the

process. What it is desired to emphasize is that it is *not* specially difficult to teach a child how to understand and to employ cartographic symbols; therefore why not use them from the outset? To use facsimile representations first is only to prolong the process and invites the resentment of the child when symbols are substituted for the drawings. Naturally the child will prefer facsimile representations if they are offered because these can be identified without effort but, if such are never offered, the child will never miss them. Moreover the child's own progress with map-making will be hindered if a start has been made with drawings of features of the landscape because the rate of progress will depend to a large extent upon the child's ability to draw recognizable representations of these things whereas most children can quickly learn how to draw simple symbols. Moreover complications are less likely to arise from lack of room when a fair amount of detail has to be shown on a piece of paper of manageable size.

Let us consider now the teaching problems posed by the fact that we have to deal with a round world and flat maps. The child has to live in a state of wonder. Unexplained and incomprehensible phenomena surround it and consequently the child has to accept (and does accept) many things as facts without explanation and merely because grown-ups say they are facts. Children are, for instance, told that the world is round and, despite the apparent evidence of their senses to the contrary, most children accept that. If, however, having gained from a child acceptance of the fact that the world is round, one then asks that same child to believe that parts of that round world can be represented on flat pieces of paper one is asking too much unless one provides some proof by demonstration. It is indeed very necessary to provide that proof lest the child begin to doubt not only that particular fact but other things told to it as facts. How can this be done? Take a small globe and a sheet of thin cardboard sufficiently large to cover the globe from the child's sight. Cut a hole in the cardboard. The size of the hole ought to depend upon the size of the globe used for the demonstration; with a twelve-inch diameter globe a hole about one inch in diameter will suffice or it might be a very little larger. With larger globes a larger hole may be provided. Now put the cardboard temporarily on one side and show the globe to the pupil, emphasizing its roundness. Next take up the sheet of cardboard (for the time being ignoring the hole in it) and let the child compare its flatness in contrast to the roundness of the globe. Finally shield the globe with the cardboard, pressing the part with the hole in it gently against the surface of the globe underneath. Let the pupil look at the small area of the globe surface which appears through the hole in the cardboard and emphasize that, although both the child and yourself know that the globe is round, that small portion which can be seen through the hole in the cardboard appears to be flat or so nearly

flat as to make little or no contrast to the flatness of the rest of the sheet of cardboard. Most children will accept this demonstration as proof that, although the world is round, small portions of its surface appear more or less flat (that is to say, not curved) which is how they themselves see portions of the earth's surface which lie within the range of their vision.

Having demonstrated that small portions of the surface of the earth can be represented fairly well on flat surfaces it becomes necessary to demonstrate that *large* areas of the world's curved surface *cannot* be accurately represented on a plane. Take an old rubber ball (a fairly large beach ball will do very well) and allow a child (or children in turn) to attempt to squash it flat; having, of course, first punctured it to let the air escape when it is squashed. The child will be able to prove to its own satisfaction that, however hard the deflated ball be squashed, it cannot be made flat like a piece of card or paper. It may also be pointed out that, even when squashed as flat as is possible, one cannot see both sides of the deflated ball at the same time. To make assurance doubly sure cut the ball into two hemispheres and allow the demonstration to be repeated with each hemisphere, pointing out that, although in this way one *can* see both sides of the ball at the same time, neither half of the ball can be squashed out really flat. The children will see and agree that it is not possible to make the round world flat or even half of it flat and that will do for the time being. Later on when some question arises about a flat map of the world which pupils see hanging on a wall it will be possible to repeat the demonstration with the rubber hemispheres but this time vee-shaped cuts may be made in the hemispheres so that they *will* go flat. With the rubber hemispheres, a school globe and a map of the world on Mercator's projection, all used together, it should not be too difficult to explain the essential distortion arising from trying to represent the curved surface of the world upon a flat map; but this is something to be reserved for a good deal later than the period of school life with which we are dealing. For the time being it will be enough to demonstrate that small portions of the earth's surface *can* be fairly represented on flat pieces of paper whilst large areas *cannot* be dealt with in the same way.

The problem about which one hears most from teachers of geography in the primary school is the problem of how to teach children what contour lines mean and what they show on the map. Admittedly this is one of the most difficult tasks which the teacher has to face but no good comes of trying to evade it altogether in the primary school—apart from other reasons, that only adds to the burden on the teachers in the secondary school! Eventually contours must be mastered and the sooner a start is made the better. How soon can that start be made in the primary school? Opinions vary but it is the writer's belief that most ordinary children who have reached the age of nine years can be brought

to understand what three or four contour lines represent on a map and that between the ages of nine and eleven years the essential principles of contouring can be mastered sufficiently to enable a child to appreciate their general significance on an Ordnance Survey map. Detailed interpretation of contouring (especially in the case of maps of regions of a mountainous nature) and section drawing must, of course, wait until a good deal later. Even in its simplest form, contouring involves the understanding of complex ideas all of which have to be understood in relation to each other and to the matter as a whole Naturally one does not talk to a child in the primary school about horizontal equivalents or vertical intervals but, nevertheless, the ideas to which these names are given must be conveyed. How can the problem best be tackled? There are several recommended approaches to the problem and the method which the writer has used with success is no doubt not novel. Nevertheless, having regard to the number of teachers worried by the problem, it can do little harm to give an account of at least one method in case that should prove helpful to someone.

The method about to be described may be followed with or without the use of water according to circumstances and preference. The use of water adds an entertainment value and compels interest but may result in more entertainment than instruction, especially if discipline is not strictly maintained. If the demonstration is on a fairly large scale, involving the use of a lot of water, it may also be difficult to obtain a sufficient supply at a fast enough rate. On the whole it is usually better to use the dry method except when a very small-scale demonstration is staged in a sink when water is a necessity and no difficulties with supply or control are likely to arise.

For the demonstration a supply of clean soil or builder's sand (or both mixed together) is necessary and this should be damp *but not saturated.* A two-foot rule, a reel or hank of narrow white tape, a box of large pins and another and slightly longer flat ruler or a similar strip of wood will also be required. A spirit level is a very useful accessory.

If the school possesses a sand tray or table under cover so much the better but, if not, demonstrations will have to be out-of-doors in the playground or elsewhere; unless they are performed on a very small scale in a sink in the classroom. Assuming an outdoor demonstration by the dry method, choose a level space and upon this make a small, artificial hill of damp sand or soil a little more than fifteen inches high. The hill should present slight irregularies of shape and varying degrees of slope but should not be over complicated.

Having prepared the stage and made sure of having everything to hand, carefully explain to the children that the flat ground in the cleared space around the model hill represents land only just above sea-level; that is to say, land between nought and fifty feet above the level of the sea. Next explain the vertical scale to be used (which it

is suggested should be one inch to represent ten feet) and demonstrate with the ruler and the strip of wood; holding the strip at right-angles to the vertical ruler and horizontal to the ground at a height of five inches. With the further end of the strip make a slight mark in the side of the model hill and explain carefully why that mark is at the same height as is the end of the strip which is held at the five-inch mark on the ruler. Here a spirit level can be useful. At this stage the children should again be reminded that in this case the five inches represents fifty feet. Now repeat the operation described, thus marking the hill at different places around it, and then fix with the pins a piece of the white tape all round the hill at the level of the marks. If long pins or even thin, sharp nails are used it will be found that the tape will stay in position quite firmly. When this has been done and the unrequired tape has been cut off the basic fifty-foot contour line will be there for all to see.

Having made sure that everyone understands what has been done so far, repeat the operation for the second and third contour lines and, when all three lines are in position, let each of the children in turn stand close to the hill so that they can look down upon it from almost directly above. They will then see three contour lines in plan just as they can see contour lines on a map. Indeed, it is a good thing to have a map available whereon may be seen the contour lines of a simple hill of similar shape. *Do not make the mistake of trying to explain too much on the occasion of this first demonstration.* Much will have been accomplished even if all that is learned this first time is what three lines drawn round a hill at different heights look like from above. Be careful, however, to explain that, when dealing with a real hill, instruments can be used to find the right levels and that the ruler and the piece of wood and the tape are merely substitutes for instruments. Such explanations are necessary to avoid doubts arising in the children's minds about the possibility of dealing with real hills, in a manner similar to that used for the demonstration.

On the next occasion when a demonstration is possible the complete operation should be performed again and, if all goes well, the opportunity may be seized to measure along the surface of the slope between contours and to point out that there is a difference between the measurement made that way and the vertical measurement made with the ruler and the stick. The *reason* for the difference may also be explained if the children seem to be able to follow the argument. If, however, this seems to be a little too much for them, the matter should not be pressed there and then but should be dealt with in the classroom before being demonstrated again on a model hill. A block of wood with one sloping and three vertical sides can help in classroom demonstrations. In the case of teachers who prefer to use water in demonstrations of contouring the procedure described is the same except that a compacted mound of sand or soil is built around the artificial hill and

water is poured into the trough between the hill and the mound until it reaches the required height measured by the ruler held vertically. When the water is drained off by breaching the circular mound, a water-mark is left on the hill and the white tape is attached at the level of that mark. Then the breach in the mound is repaired and more water is poured in carefully until the second contour level has been reached and the process is repeated as often as necessary.

Instruction must be continued patiently but progressively after the all-important beginning has been made. Since, however, it is at the beginning that the real difficulties seem to be encountered the development of later teaching methods are beyond the scope of this article. It is confidently believed that, starting at age nine or thereabouts and using methods similar to those described for the earlier lessons, most pupils should be able to understand and to interpret the salient features of One-inch and 1 : 25,000 Ordnance Survey maps by the time they have reached the age of eleven years. A recent investigation carried out by a research committee set up by the International Geographical Union has provided some interesting evidence in support of that view.

Field Study from a Narrow Boat

M. J. FROST

An intrinsically appealing approach will take students far along the way towards the willing accomplishment of a task, whether in the classroom or in the field. Thus in teaching geography the task is often to etch into the mind patterns and relationships in the landscape which the student may otherwise overlook.

The landscape, being ever present in daily life, tends to become over-familiar and therefore the excitement of a novel traverse may alone prove capable of calling to light the significant geographical relationships.

Geographical study in the field, planned so that it falls easily within the capacity of all students, can be freshened in effect by taking to a waterway. At first sight the narrow boat, some seventy feet in length and seven feet in breadth, appears too confined to provide good viewpoints. However, it must be remembered that the boat rides well above the water affording an advantageous view over both sides. Furthermore it is the nature of canals at all times to make map orientation easy, thus ensuring that pupils can locate their position frequently and accurately.

Canals are supremely worthy of geographical study. They bear witness to the ever-present minute sculpturing of the land surface by man. They also testify to the point made by Professor Bryan[1] that the present landscape may well be thought of as a palimpsest. The traces of the Industrial Revolution thus appear as geographical writing over an even older underlay. Among this partially erased script only the line of the canal is closely related to the guiding form of the land surface. This cut follows the contour of the ground sacrificing shortness to ease and cheapness of construction. From time to time it also lengthens its journey to aid water conservation in the higher levels of the canal by adopting a course which ensures consequent reduction or absence of locks. The first canals played an important part in making possible the Industrial Revolution; two essential elements besides iron in this change were coal and water. Canals thus linked these bases of the revolution and the geography of this period is still preserved, though not always completely, alongside them.

Hence a navigation of the waterways of the Midlands, which provides many views of collieries, potbanks and ironworks, gives also an educational experience which intensifies the reality of a geographical study of the region. Further south, away from the slag- and smoke-ridden environment of the first Revolution, the landscape becomes harmonious

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in a different way. Here it is made up from the navigation works, the lock cottages, wharves and warehouses, aqueducts and innumerable bridges.

To young students the waterside scenery of gay boats, the black gates of locks with their massive walls of worn stone, plants, animals, fish, birds and long placid vistas of water possess an intrinsic appeal. If they are urban children they delight especially in the way the green countryside of the canal stretches into their town. They take pleasurable interest in such features as old mills, lockkeepers' cottages, the passage through locks where the water rushes and boils out through the gates, the fall of the boat, the gloom at the lock bottom and the clarity as the ponderous gates open to show a fresh vista of smooth opaque water.

The passage of other craft, often two together, heavy, long and slow-moving with black hulls, coloured upper-works and gleaming brass or copper, carrying coal or general merchandise, excites eager curiosity; copious notes can be made before the broad band of the visible countryside once more recaptures complete attention as it moves slowly past the craft.

Because of these things a canal journey has an effect upon students which can be turned to the teacher's need. The result itself is instant, even overwhelming, and can be made to last if, using his artistry as a teacher, the geographer draws relationships and meaning from the impact upon the pupils. Lacking experience the students have to fit the cut into the terrain and country. The teacher's methods help them to find reasons for the route and to learn how man has used the relief and topography to his best advantage. For whilst the journey itself provides a way of investigating an area in town and country from a unique location it is clear that the teacher, by his own preliminary studies, can supply the wider background.

Besides introducing water, boats, fauna and flora, architecture and fishing into a town, the canal is also an engineering achievement; and furthermore it has an economic significance the full value of which can be grasped by selecting data from the range freely available in the offices of the waterway authority. The addresses of these offices may be found under "British Waterways" in the local or regional telephone directory, and through them one can begin the organization of a sample traverse by boat. Generally speaking all regions have available for hire fifty-seat converted narrow boats which are weatherproof and which also provide refreshment and toilet facilities.

A furbished craft gives ample room for a party of fifty, but as it is not easy to hire a coach of more than 41 seats, the party may be limited to 38 students and 2 teachers. Even with a party of this size the cost remains low. The hire of a craft complete with crew of three varies with the number of hours of charter but is always moderate. In 4 hours, depending on the particular route, a distance of 9 miles may be covered, whilst a full day might ensure some 30 miles.

Geography teachers will already realize that for full success some preparatory school work is required both from themselves and from their students. The method in general is that of a field excursion, on the lines described, for example, in an account given in *Geography* in 1956[2]. It follows that preliminary planning will embrace the provision of transport to and from the canal as well as the charter of the boat. The school work will centre around the preparation of both papers and maps. Some thought will be devoted to thinking out how the pupils may best record observations. Thus a record of the band of landscape traversed can be made both in sketch maps and in diagrams, based on reality closely and carefully observed from the craft. These records in turn form the necessary data for the construction of a transection, using the O.S. map to amplify detail, later on in the classroom. In this manner features seen and recorded in the field can be correctly interpreted to give a true record of the landscape. For the collection and sketching of these facts, which are a necessary part of a true and faithful account, the slow speed of the journey is an invaluable aid.

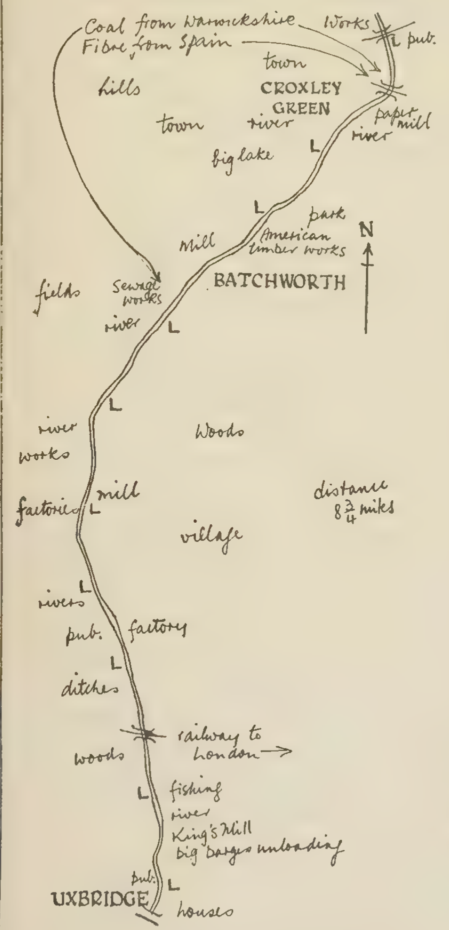
The work in the boat is best divided between groups, a way of working which is quite practicable because the craft offers a good view of either side and an all-round view to the adventurous spirits at the bows, on the steps, or with the steersmen. The objective of the hiring is to take full advantage of these good and unique viewpoints so that a canal-centred view of the relationship between canal, landscape and the work of men can be the better observed. To make certain that the tasks of observation are completed in a logical sequence each student is provided with two duplicated sheets. On one (Fig. 1) he will attempt a skeletal transection; on the other, which is annotated with columns for place names and grid references, he will record time and observations i.e. a simple log. Each boy or girl thus has a task to do or to share. Each has refreshment and protective clothing suitable to the excursion. Before leaving everyone has a clear idea of what is expected and an outline of how best to go about the tasks set.

A journey of this kind should not be an isolated event but should form part of a course of selected exercises in the field. Such studies would commence in the first year with local surveys of the school neighbourhood. They would be continued in the second and third years with farm studies and longer geographical excursions. The canal journey therefore fits into the fourth or subsequent year in which it is appropriate to study the communications of the region.

This was the plan followed by the writer when teaching in a London school. There was a bias towards the examination of bold features of the landscape but otherwise the emphasis was upon the human geography of the London Region. Such a programme of planned field study was only made possible through the co-operation of the

A Transect Chart of Our Journey by Narrow Boat

The portion of the canal we will be travelling along is sketched below. You are asked to record on the right hand side of this sheet your notes on the things you see from the boat.



There is too much water in this canal. It is flowing away at the sides. I can see a sandy beach; it seems to have a step in it. On the slopes towards the sun there are many houses. It is high there.

A big mill, much old cardboard, bales of long yellow fibers, coal in barges.

Here is a big woodyard, lorries and boats bring the wood. Ahead is a very steep hill to the south, it is wooded and grassy. It looks different to the other side.

Cress is growing here. It looks a very wet job to look after it. Sewage works, a great lot of coal on the bank.

The river has come back again. It is still hilly towards the sun, but away the land is flat and there are cabbiges growing. A large mill, also an iron works.

There is a farm on the hilly side and there are black and white cows everywhere.

The flat side is just fields but now on the hilly side there are many houses. There is no lake there.

Now it is all flat many ponds, and the hills and houses are far away. The canal is very strate now, not curvy. A railway bridge and woods.

The ground is rising to the east and there are many houses on the rise.

Uxbridge. It has an old inn and a large mill with full size barges just like on the Thames.

Fig. 1.—A transect chart and map as completed by a boy in the fourth form, technical stream.

Education Authority, the Head Master and staff of the school and the parents of the children.

The organization of a canal journey was, whenever possible, carried out by the pupils, with the master advising, guiding and checking financial matters. This co-operation by the students in the planning is most important since it ensures that from the beginning they are willing and active participants. They are made aware by their own activities that the field work in geography truly concerns them. Hence the dynamic part of learning is also always present, to their future benefit.

Before an actual journey maps were hung up on the classroom wall. In one excursion the route was downstream from the Cassio Bridge, Croxley Green to the "Leather Bottle" at Uxbridge, a distance of $8\frac{3}{4}$ miles. The maps used were the O.S. One-inch New Popular edition sheet 160; the 1 : 25,000 sheets TQ/09 and TQ/08 in conjunction with a teacher's sketch map of the relevant portion of the Grand Union canal. On this sketch map 10 locks were clearly marked, a fact explained by the O.S. maps which showed that this journey would be southward down a constantly declining gradient in the Colne river valley.

This route lay along a portion of the Grand Union Canal, once known as the Grand Junction Canal because it joined the Oxford Canal to the Thames. Throughout the course of the journey the students recorded where the river Colne flowed into and out of the canal, thus seeing from the beginning that a canal depends upon supplies of water from adjacent rivers and that indeed it is a way of "using" rivers.

The excursion commenced at 9 a.m. when after registration the students, carrying refreshment and their recording papers, left the school by coach. The hired boat came smartly on time alongside the tow-path above Cassio Bridge. Before boarding the vessel all students were briefed against the dangers of mishap—the life of the waterway has hazards of its own. It is easy to have one's fingers nipped by pressure from the boat against obstruction or to slip into a lock with a very real danger of mutilation or of drowning.

Immediately after passing under the road bridge the southern bank is unprotected and the students saw wave action and the subsequent formation of a gently shelving beach. This was evidently created from the debris on the gently inclined wave-cut platform. It was soon seen that the canal at this point is fed from the Colne. The supply is more than adequate since overspill channels are provided to carry away the surplus water back into the old course of the feeding river.

Looking back the pupils could see the spur between the tributaries of the Colne and noted the beginnings of settlement which becomes dense towards Watford.

The boat passed beneath two railway bridges and the attention of the students was soon drawn to the sharp contrast between the wooded and grassy steeps of the edge of the South Hertfordshire plateau and the flat valley floor of gravels, a contrast etched by the line of the canal. Here the journey by boat is the only possible way of passing along this outstanding geographical boundary.

Next industrial premises came into view at Croxley Mill. Colliers lay alongside the quayside being unloaded mechanically. Other raw materials used by this mill and transported thence by water were esparto grass and cardboard scrap for reclamation.

Just above the lock at Batchworth, timber was being delivered from barge to yard at the same time as it was also being unloaded from lorries.

Below Stocker's Lock the arable fields of the western side ceased. In their place came first an extensive watercress farm and then the Colne Valley Sewerage Plant. The cress farm could be studied closely from the height of the boat—a task that would have been very difficult without protective clothing on land. Coal was being delivered to both these sites but the Sewerage Plant alone possessed special facilities for handling deliveries.

An interesting contrast was then noted between the lightly constructed factories of a modern industrial estate on the flat flood plain and the heavier installations of industry sited on the eastern higher terrace of Harefield.

At King's Mill between Locks 88 and 87 the students recorded the first appearance of wide barges which had been worked from the Pool of London via the river Thames and Brentford entry. From their experience they were able to deduce the reason for the warehouse facilities and transhipment quays. Here again were recorded dynamic details which would only have reality to those who journeying by boat had experienced the narrow passage of the upstream locks.

With the coming alongside at the waterman's inn the journey was over. The coach was waiting as planned and the party arrived back at the school to time, seven hours after departure.

Used in a balanced curriculum a field study of this kind has value because it is a fresh aspect of well-tried methods and one which, inherently based on the form of the ground, suggests lines of future enquiry for the advancement of geographical knowledge. At the same time its moderate cost is readily justifiable because it is essentially a scientific exercise. The students really look at things for the interest of the waterway develops their capacity for observation. They then record fully and honestly what they see and there are no text-books of such journeys—as yet—to prompt them.

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This Changing World

INDUSTRIAL CHANGE IN LANCASHIRE AND MERSEYSIDE

Too many people think of Lancashire's industrial potential in terms of cotton textiles and certain associated industries whereas, in fact, the region now possesses a surprisingly broad industrial base. In 1958 the engineering, shipbuilding and electrical goods industries (Order VI of the 1948 Standard Industrial Classification)* provided 22 per cent of total industrial employment in Lancashire and Merseyside—a proportion similar to that provided by the textile industry. Actual and percentage changes in employment in each industry group between 1951 and 1958 are given in Table I, which also places each industry in regional and national perspective (columns E and F).

Table I

LANCASHIRE AND MERSEYSIDE: INDUSTRIAL EMPLOYMENT

Industry Order[a]	Industry	A	B	C	D Per cent Change	E Per cent of Regional Total[b]	F Per cent of Great Britain Total[b]
		Employment (thousands)					
		1951	1954	1958	1951–58	1958	1958
III	Non-metalliferous mining products	43·5	42·7	45·6	+ 4·8	3	14
IV	Chemicals and allied trades	103·1	104·5	107·7	+ 4·4	8	20
V	Metal manufacture	39·2	39·9	40·8	+ 4·1	3	7
VI	Engineering, shipbuilding and electrical goods	285·5	290·1	305·8	+ 7·1	22	15
VII	Vehicles	95·0	109·6	114·3	+20·2	8	10
VIII	Metal goods not elsewhere specified	47·7	45·9	52·2	+ 9·4	4	10
IX	Precision instruments, jewellery, etc.	8·0	5·6	5·2	−35·0	—	4
X	Textiles	395·0	367·1	308·7	−21·8	22	36
XI	Leather, leather goods and fur	14·1	13·4	10·9	−22·7	1	17
XII	Clothing	113·5	108·5	99·2	−12·7	7	17
XIII	Food, drink and tobacco	121·2	125·2	136·0	+12·2	10	15
XIV	Wood and cork manufactures	36·1	33·8	30·1	−16·6	2	11
XV	Paper and printing	68·7	69·0	76·6	+11·5	6	13
XVI	Other manufacturing	55·5	56·5	54·5	− 2·2	4	19
	Total all Manufacturing	1427·2	1411·8	1388·4	− 2·7	100	16

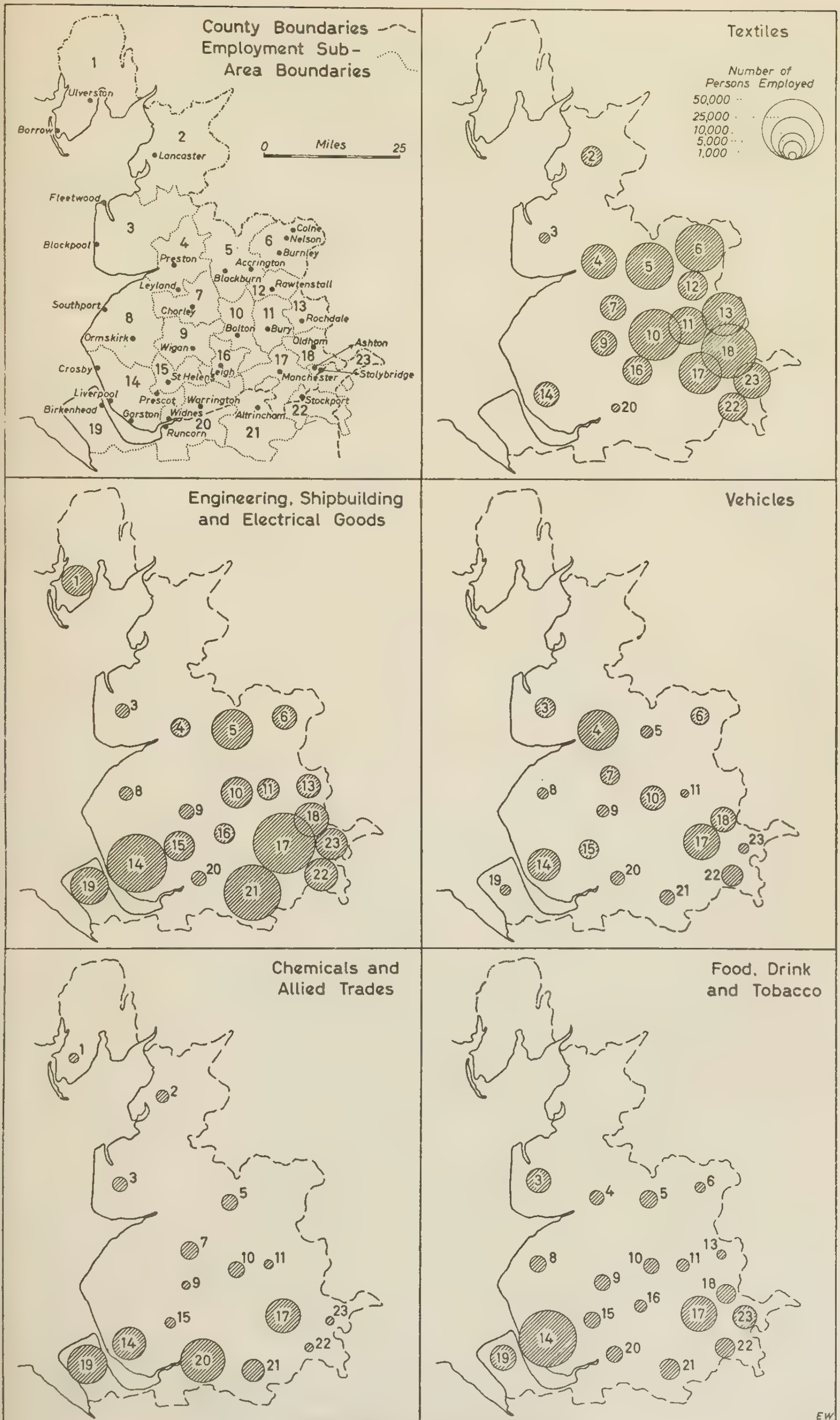
[a] Standard Industrial Classification, 1948.
[b] Rounded to nearest whole number.

Source: Calculated from material supplied by the Lancashire and Merseyside Industrial Development Association and the Ministry of Labour *Gazette*.

Comment here may be limited to the continued decline of the textile industry (mainly cottons) and the steadily increasing role of firms concerned in some way with metal-working. Between 1951 and 1958, when the region experienced a slight overall decline in industrial employment and employment in textiles declined by more than one-fifth, the four metal-working industry groups (Orders V to VIII inclusive) together increased their employment by about 10 per cent. The region also has a strong and growing interest in other important industries, such as chemicals, food, drink and tobacco, and the paper and printing industries.

The distribution of employment in the region's five leading industries is shown on the map, the sub-areas being those used by the Lancashire and Merseyside Industrial Development Association. This indicates that the localities in which the declining textile industry remains strongest (sub-areas

* A revised Standard Industrial Classification was introduced in 1959. Thus 1958 is the last year for which employment figures are readily comparable with those for earlier years.



Distribution of employment in 5 leading industry groups, 1958.

5, 6, 10, 11, 13 and 18 on the map) are not in general the major centres of the growing industries. Only in engineering (Order VI) do the traditional cotton areas show substantial capacity, and much of this is oriented to the textile industry's requirements. Similar problems of dependence on a single industry are also evident from the map in the case of sub-area 1 (Furness). Here employment is concentrated in the industries of Order VI, but within that Order overwhelmingly in shipbuilding. The chief growing industries are very weak here. The 23 sub-areas on the map may be combined to form eight reasonably distinctive areas which serve as the basis of Table II. This table shows the proportion of total employment provided by each industry

Table II

DISTRIBUTION OF EMPLOYMENT, BY AREA AND BY INDUSTRY, 1958

Area[a]	*Industry Group* (1948 *Standard Industrial Classification*)[b]														*Total Employed (thousands)*
	III	*IV*	*V*	*VI*	*VII*	*VIII*	*IX*	*X*	*XI*	*XII*	*XIII*	*XIV*	*XV*	*XVI*	
	Per cent[c]														
Greater Manchester area (17, 21, 22, 23)	2	6	3	30	7	4	neg	13	neg	13	9	3	7	4	414·0
Merseyside area (14, 19)	2	14	2	27	6	5	neg	4	neg	4	21	3	6	6	245·6
"Coal–Chemical" area (9, 15, 16, 20)	15	16	8	13	6	8	neg	13	1	5	8	2	4	1	172·8
Textile area 1 (10, 11, 13, 18)	neg	2	2	17	7	2	neg	49	1	5	5	2	5	2	250·1
Textile area 2 (5, 6, 12)	2	3	neg	20	4	3	neg	47	neg	7	4	1	5	2	146·5
Preston area (4, 7)	neg	6	5	6	34	neg	neg	30	neg	2	5	2	4	6	80·7
Coastal area (2, 3, 8)	1	10	neg	10	14	2	1	14	neg	7	22	4	3	11	56·6
Furness area (1)	neg	6	13	59	3	neg	neg	2	neg	5	4	neg	4	1	21·1

[a] Numbers in brackets denote the sub-areas, as shown on the map, included in the larger area.
[b] Industrial Groups named in Table I.
[c] Given to nearest whole number. "neg" = under 1 per cent.

Source: Calculated from statistics supplied by the Lancashire and Merseyside Industrial Development Association.

"Order" in each area. From it we can see again that the chief "problem" localities remain in the two textile areas, where almost half of total industrial employment remained in textiles in 1958, and in the Furness area. There is hope, however, that the re-organization and re-equipment of the cotton textile industry will lead to its stabilization, probably at a lower level of employment, and that new electrical and mechanical engineering plant will be attracted to these areas.

Problem localities apart, the new industrial Lancashire and Merseyside is a region in which the leading national industries are playing a large and increasing role. Non-electrical and electrical machinery, motor vehicles and chemicals, together provide practically one-half of the total value of the country's exports at the present time. In these vital industries (Orders IV, VI and VII), Lancashire and Merseyside possess a large and growing share of national capacity (Table I, column F).

Undoubtedly there are many elements in the environment of the region that will have proved attractive to such modern industries in the post-war

years. Labour, sometimes possessing utilizable skills, has been obtainable during periods of "over-full" employment elsewhere in the country. Sites, existing industrial floor space and essential services have often been available. Some firms have been attracted by the availability of component part manufacturers; others by the proximity of the port of Liverpool; yet others by a combination of circumstances including, in addition to the above, such things as water supply, material supplies, and Local Authority eagerness to help. But this is not all. The region has been greatly affected by government activity, especially in the post-war years. Three problem areas were designated as "Development Areas" and thus received special government assistance, financially and otherwise, to attract new industry. These were South Lancashire (around Wigan–St. Helens), Merseyside, and Northeast Lancashire (around Accrington, Burnley, Nelson and Colne). But the whole region was favoured in the issue of Industrial Development Certificates. Between 1945 and 1958 the Northwest Region* obtained more new industrial floor space than any other standard region. (Northwest 60 million square feet; Midland 55 million; London and South-eastern 52 million.) Under the 1960 Local Employment Act, which replaces previous legislation relating to industrial distribution, parts of the region (now called Development Districts) will continue to receive assistance in attracting new industry.

Apart from such general assistance to the region as a whole, two major industries have recently received special government attention. The motor vehicle industry here will experience a particularly strong impetus. The country's leading motor-producing firms have been anxious to expand capacity, but they had considerable government pressure brought to bear upon them to locate new plant in areas away from the Midlands and London. Ford, Vauxhall and Standard-Triumph have consequently selected new sites around Merseyside (at Halewood, Ellesmere Port and Speke respectively) which will result in a substantial increase in employment in the area's motor vehicle industry. (The British Motor Corporation also have a project in the area, at Kirkby, but this will in fact take over the production of household appliances and certain industrial equipment from the Birmingham car body plant of Fisher and Ludlow—a B.M.C. subsidiary.) The ailing cotton textile industry has also attracted a fair measure of government interest which culminated in 1959 in a government-financed re-organization plan. Between April 1959 and April 1960 the numbers of installed spindles were practically halved, and of installed weaving looms reduced by about two-fifths. (A large proportion of the scrapped machinery had, in fact, been previously lying idle.) The second part of the plan, now in progress, will involve government-aided modernization and re-equipment schemes. For such reasons no explanation of the present industrial structure in Lancashire and Merseyside would be adequate if it failed to emphasize the social and political element. The pattern of industrial production now emerging here probably owes as much to government intervention as to geographical advantage.

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* The boundaries of this region differ slightly from those for Lancashire and Merseyside shown on the map, mainly by including all of Cheshire.

LE REMEMBREMENT RURAL EN FRANCE

After nearly twenty years the impact upon the French rural landscape of *Loi No. 1071 du Mars 1941 sur la réorganisation de la propriété foncière et le remembrement* is becoming clear. *Remembrement* has been defined as "an operation which has as its aim the improved cultivation of the land by substituting for the existing defective division of the land into parcels a new division characterized by a smaller number of parcels, larger in size, easily accessible and suitable for cultivation by machinery". It consists not of a multiplicity of individual exchanges of land but of a collective operation carried out on a communal basis, and it has been necessitated by *morcellement* (the division of land among a large number of owners) and *parcellement* (the division of a single holding into scattered strips or parcels). Such an extreme division of land-holdings (in 1891 the cultivated area in France was divided into 151 million parcels

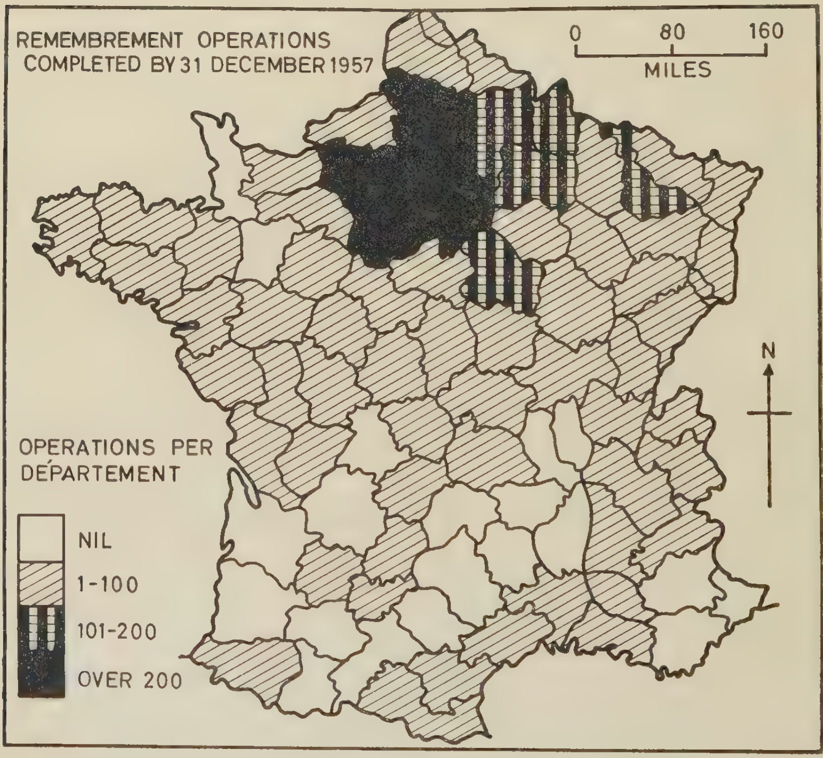

Fig. 1

each averaging only 0·9 of an acre) made cultivation difficult and at times uneconomic, since it discouraged the introduction of machinery, encouraged boundary disputes and consumed inordinate energy and time as the cultivator travelled from parcel to parcel.

Under the Act of 1941 the establishment of a Commission to enquire into the advisability of measures of land consolidation in any commune can be initiated by tenants, landowners or the State. Once it has been decided that remembrement would be beneficial, the actual work of regrouping the

holdings is undertaken by a special Government body, the Service du Remembrement, which prepares a map indicating all private property, together with an inventory of the owners, areas and values of individual parcels. Land which is public or land which is built on, enclosed ground and land containing springs or quarries does not come within the scope of the Act, and so remains in its owner's hands. All other land is given a value according to the productivity of the soil. After a public enquiry to consider objections, the Service draws on maps a new network of roads, since each new parcel must have contact with a road, and the allotment of new parcels follows, guided by two principles: first, each owner must have new land of a total productive value equal to that of his former property (value rather than area is the deciding factor); secondly, the new grouping must lead to the suppression of enclaves and to consolidation. To reduce the number of parcels to a

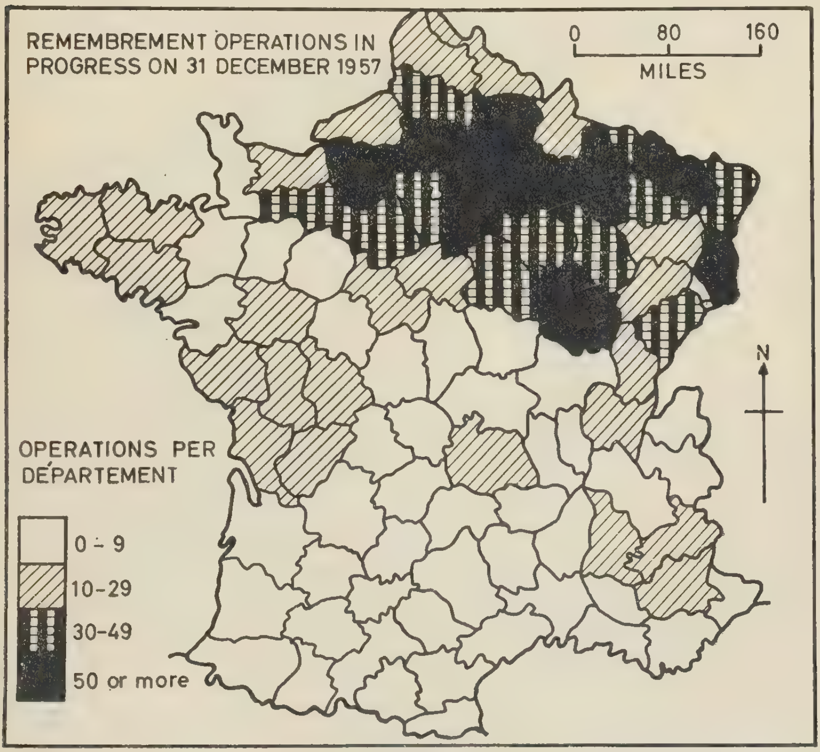

Fig. 2

minimum, each owner is given a unified block of parcels in each type of soil and zone of distance from the village centre. A complete consolidation of an individual's property into one single block has not been possible, for two reasons: variations in soil productivity and suitability for different crops have led the French landowner to prefer land in each of the soil types, so that inevitably his land must be to some extent in scattered units; and all farms and settlements are often concentrated in the village so that it has been necessary to allocate new property units in various zones of distance from the

village in order to equalize as far as possible the travelling times of all the landowners.

A detailed field study of four communes in Beauce showed that remembrement effected a reduction of 75–85 per cent in the number of property units in each commune, and that after remembrement an average unit was 4–5 times the area of an average unit before remembrement. The importance of remembrement throughout France as a whole has been considerable. At the end of 1957 operations of remembrement initiated under the 1941 Act had been completed in 3185 communes in 70 Départements, affecting an area of $2\frac{1}{4}$ million hectares (Fig. 1); operations were in progress in 1587 communes in 77 Départements, affecting an area of $1\frac{1}{4}$ million hectares (Fig. 2); and future operations were planned in 1609 communes in 77 Départements affecting an area of $1\frac{1}{2}$ million hectares (Fig. 3). The maps

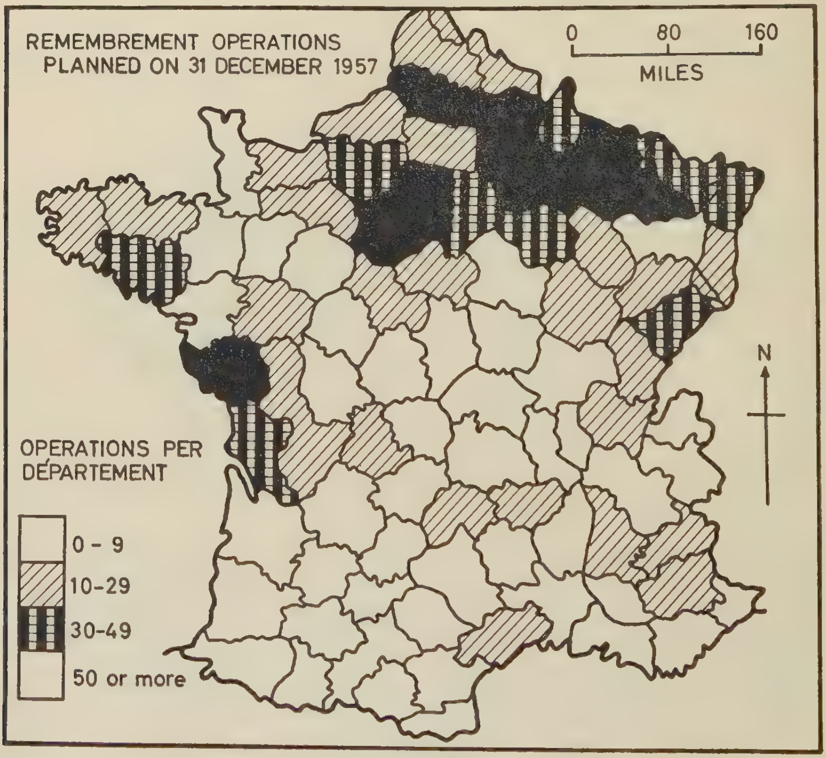

Fig. 3

show that remembrement has been most extensive in the north and east of France, but it has been applied throughout the country and only 5 Départements had no operations completed, in progress or planned at the end of 1957: these were two Départements in Provence, one in the Central Massif and two in Gascony. These statistics and maps indicate the influence of remembrement in modifying significantly the rural landscape of France. (*La Documentation Française Illustrée*, No. 68, *Le Remembrement Rural*, 2nd Edition, Paris, 1957. Figs. 1, 2 and 3 have been compiled from statistics supplied by the Service du Remembrement, Circonscription de Paris-Est.)

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CLIMBING THE HIGHEST MOUNTAINS

In May 1960 members of a Swiss expedition reached the summit of Dhaulagiri, the last of the world's ten highest mountains to remain unclimbed. This feat marks a significant stage in Himalayan exploration. Kenneth Mason states that the first knowledge of the Himalaya came to Europe through Alexander's invasion of India in 325 B.C. and that Jesuit missionaries were penetrating the mountains in the early seventeenth century. But the first systematic exploration sprang largely from the interest taken in exploration by Robert Colebrook, the Surveyor-General of Bengal in the early years of the nineteenth century. In 1802 he began to realize the great height of the Himalaya and in 1810 a calculation was made of the height of Dhaulagiri which was substantially correct. The height of Everest was discovered in 1852. The first major expedition organized from England to explore and climb in the Himalaya was led by Martin Conway to the Karakoram in 1892 and it is known that an expedition to Everest was contemplated in 1893. In the years that followed expeditions went to the Himalaya with ever-increasing frequency, and the first serious attempt to reach the summit of one of the greatest mountains was made by Mummery's party on Nanga Parbat in 1895. Yet it was not until 1950 that any of the mountains over 26,000 ft. was climbed. In that year two Frenchmen reached the summit of Annapurna, the tenth highest mountain. The contrast between repeated failure in the half-century before 1950 and the astonishing success since merits comment.

Early climbing expeditions followed hard on the heels of the explorers; indeed, as the accounts of the early Everest expeditions show so well, they often had to do much exploration themselves. Thus they could not know in detail what topographical difficulties would confront them, nor how long it would take to surmount them. Since virtually everything required by an expedition must be carried with it from the rail- or roadhead, often many days' march from its objective, and since the carriers must all be fed and provided for, lack of such knowledge complicates the problem of getting the right supplies to the right place at the right time.

In the Nepal Himalaya, where most of these mountains are situated, the right time is quite narrowly defined. From November to April weather conditions are dominated by an air mass over the continental interior, winds are northwesterly and at high altitudes they are so violent and so bitterly cold that climbing is impossible. It is only with the onset of the monsoon, bringing warm moist air from the Bay of Bengal, that these conditions moderate. But as soon as the monsoon is fully established climbing is again prevented, this time by great quantities of soft new snow which is liable to avalanche. The lull before the monsoon becomes established is brief—usually only a few days—and the time of its occurrence can be only roughly predicted; it may even not occur at all. So it is important for an expedition to have its camps properly established and be in a position to make its bid for the summit as soon as the fine weather arrives. There is another lull in the autumn when the monsoon dies away, but some time must elapse before the condition of the snow improves and by then the northwest wind is making itself felt again and the days are becoming shorter. It was naturally some time before this weather regime and its effect on the high mountains was unravelled, and in fact it was not fully understood until the later 1930's.

Another obstacle whose effects are even now not completely known arises from the decrease in atmospheric pressure which accompanies increasing altitude, and the consequent diminution in the amount of oxygen available. (At the time of writing an expedition is in the Everest area with physiological research as one of its principal objectives.) Anyone taken suddenly from sea-level to a height of 28,000 or 29,000 ft. would die within a very short time. But by advancing gradually over a period of several weeks it is possible to become acclimatized to life as high as 21,000 ft. Above that height physical deterioration is more rapid than acclimatization and the absolute minimum of time must be spent there. Oxygen lack drastically reduces the rate at which even the fittest man can climb, and to go from 21,000 ft. to one of the highest summits requires several days of all-out effort. High camps must be prepared in advance and those who are to make the final assault must not exhaust themselves in the process. One of the ways in which the body endeavours to obtain sufficient oxygen from a rarefied atmosphere is by increasing the volume of air breathed, large quantities of cold air of low absolute humidity being taken into the lungs and there warmed and moistened. The chilling and dehydration which result can have serious consequences, and the significance of the latter especially has only recently been fully realized. All these adverse effects can be mitigated by the use of a supplementary supply of oxygen, but this together with the apparatus for dispensing it must be carried by the climber. Before the war the weight of the apparatus in relation to the supply available was such as to offset substantially or completely the benefit derived.

Though during the brief climbing season the cold is not unendurable it is still severe, and warm, light, windproof clothing is essential. Though this was realized comparatively early neither the material nor the experience in designing clothing suitable for severe conditions was available and a well-known photograph taken on one of the earliest Everest expeditions shows two men high on the mountain wearing tweed jackets, breeches, puttees and ordinary leather boots. But it is not only oxygen apparatus and clothing that have improved significantly. Such other items as tents and cooking equipment have done so too, and modern methods of packing food have helped to reduce the weight which has to be carried. Thus we see that in the years since the war advances in several directions, apart from actual skill in climbing, have combined to reduce the risks and bring the physical strain of going so high within the limits of human endurance.

Climbing technique has also advanced, but this has been a less important factor. Climbing which is technically difficult can be undertaken only on a relatively small scale, where the demands on staying power are small. Climbers used to British rocks who go to the Alps for the first time find that they cannot at once tackle routes of a standard which would give them no trouble at home. The same challenge of scale is presented in a more acute form in the Himalaya. Moreover, Himalayan snow does present problems of its own. At very high altitudes it may remain soft and powdery indefinitely instead of developing a firm crust, and, lower down, snow which by criteria applied in the Alps would appear to be safe may in fact be in danger of avalanching, as experience below the North Col of Everest, among other places, has made all too painfully clear.

Reference has already been made to the ascent of Annapurna in 1950. The accompanying table shows the date of the first ascent of each of the ten highest mountains and some other details. It will be seen that the next successes were gained on Everest and Nanga Parbat. The story of Everest is well known and no attempt will be made here to give an account of the other expeditions as most of them are adequately described in the *Alpine Journal* and in several cases full-length books are also available. But the almost miraculous outcome of the final expedition to Nanga Parbat is worth recalling. The summit of this mountain which has claimed the lives of no less than 28 men was first reached by Hermann Buhl who accomplished the final part of the climb alone and was benighted on his way back to the highest camp but nevertheless returned safely. There must be very few people indeed who have survived a night out under such conditions.

Name	*Height in Feet*	*Date of 1st Ascent*	*Summit Reached by*
Everest	29,028	1953	Edmund Hillary and Tenzing Norkay (John Hunt)*
K2	28,250	1954	A. Compagnoni and L. Lacedelli (Ardito Desio)*
Kangchenjunga	28,146	1955	George Band and Joe Brown (Charles Evans)*
Lhotse	27,890	1956	Ernst Reiss and Fritz Luchsinger (Albert Eggler)*
Makalu	27,790	1955	Jean Couzy and Lionel Terray (Jean Franco)*
Dhaulagiri	26,795	1960	K. Diemberger, P. Diener, E. Forrer, E. Schelbert and 2 Sherpas (Max Eiselin)*
Cho Oyu	26,750	1954	H. Tichy, S. Joechler and Pasang Dawa Lama (Raymond Lambert)*
Manaslu	26,658	1956	T. Imanishi and Gyalzen (Y. Maki)*
Nanga Parbat	26,620	1953	Hermann Buhl (Karl Herrligkoffer)*
Annapurna	26,492	1950	Maurice Herzog and Louis Lachenal (Maurice Herzog)*

* Expedition leader.

Last year's expedition to Dhaulagiri witnessed an interesting innovation in the use of a light aircraft to take supplies up to the base camp, thus avoiding a good deal of difficulty over transport by porters, the only other available method.

(For further reading see Kenneth Mason, *Abode of Snow: A history of Himalayan exploration and mountaineering*, London, 1955.

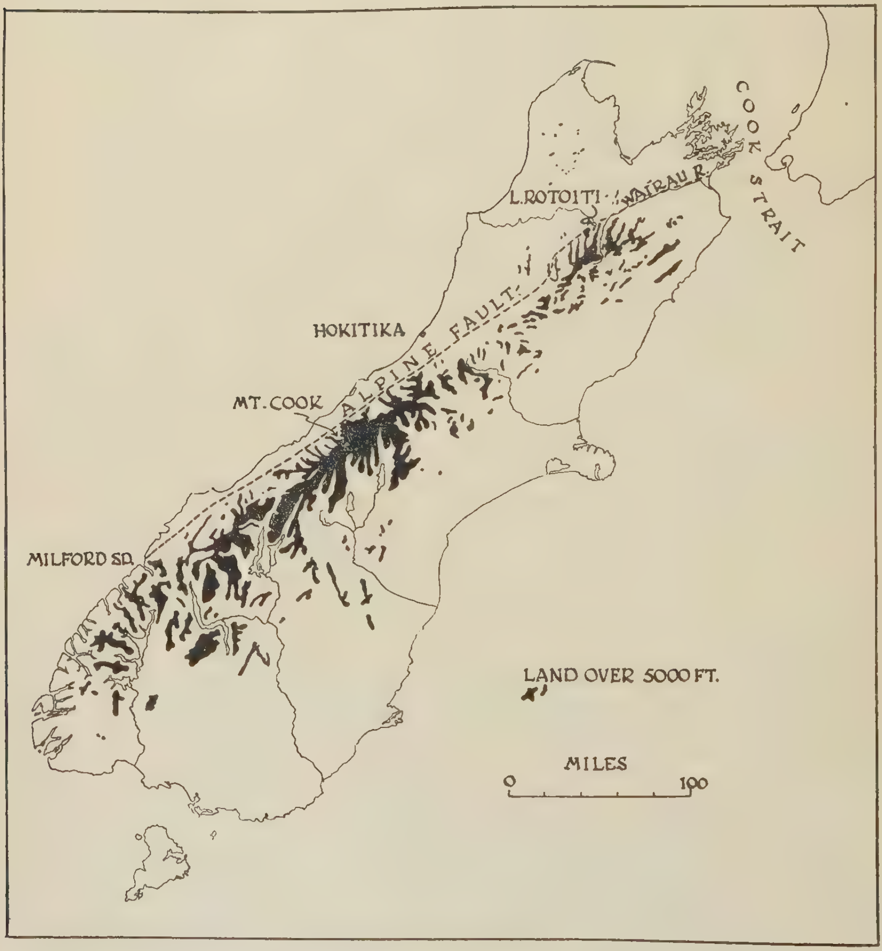
For a more popular account specifically concerned with the highest peaks see G. O. Dyhrenfurth, *To the Third Pole: The history of the high Himalaya.* Translated from the German by Hugh Merrick, London, 1955.

It will be noted that the height given in the latter book for each mountain is greater in almost every case than in the table above. The difficulties of measurement and calculation are such that uncertainties are bound to exist. The more conservative figures are derived from the Survey of India and should be adhered to.)

Department of Geography, University of Leeds A. M. Ferrar

THE ALPINE FAULT, SOUTH ISLAND, NEW ZEALAND

Outstanding in the structure of the South Island, the Alpine Fault, a major fault on any scale, controls the position of a linear topographic depression. In the past fifteen years, geological mapping has accurately delimited the fault along its full length on land, almost straight for three hundred miles from Milford Sound northeast to Lake Rotoiti, from which it extends, as the Wairau Fault, east-northeast along the Wairau Valley to Cook Strait. The importance of the fault has, however, as yet scarcely been noted in geographical literature.



The depression, rarely reaching above 1000 feet between the coastal ranges and the Southern Alps, is paralleled, generally less than fifteen miles to the southeast, by the crest of the Southern Alps with its peaks up to 12,000 feet. Northwest of the Mount Cook region of the Alps, coastal ranges west of the fault are absent, so that there is no clear topographic depression but, with only low hills to the northwest, the front of the Alps is at its most

impressive. Most of the many large rivers that flow west from the Alps to the Tasman Sea cross the fault at right angles and in general only minor tributaries flow along the depression itself.

The over-steepened northwest front of the Alps owes its height to uplift of the main range relative to the coastal ranges and plains. Beginning about the Pliocene and most rapid in the Pleistocene, this uplift continues to the present day and, in the major valleys, steps on river terraces only a few thousand or even a few hundred years old indicate the displacement caused by the most recent movements. But recent and earlier movement has not been only vertical and it has been suggested that, in all, the northwest side of the fault has moved as much as three hundred miles north-eastward relative to the southeast side. It is to be expected that a wide zone of crushed rock would be found along such a major fracture and it is along this zone that the narrow linear depression has been formed.

The forested front of the Southern Alps is scarred at intervals by landslips in the shattered schists that lie immediately to the east of the fault along most of its length. The schist, uplifted faster than normal erosion can remove it, locally rides westwards under the influence of gravity for up to half a mile over the moraines and glacial gravel of the depression, and local streams spread fans of gravel into the major valleys. The resultant aggradation, in a region in which rainfall increases southwards from about 100 to over 200 inches annually even on the lower ground, brings in its wake problems of flooding and erosion. The farming areas of Westland are small and scattered and some of the better areas, for example the Kowhiterangi–Kokatahi plain inland from Hokitika and the Whataroa flats 40 miles farther south, are constantly under threat; no small part of this is due to the rock debris brought to the rivers by rapid erosion along the western side of the Alps, uplifted along the line of the Alpine Fault.

New Zealand Geological Survey, R. P. SUGGATE
Department of Industrial and Scientific Research

New Books for Schools

L. J. JAY

In his lively and informative manual for observant tourists entitled *See For Yourself*, first published nearly thirty years ago, Edmund Vale devised a useful chart which enabled the conscientious sightseer to make a rapid inventory of the architectural features and furnishings of an English parish church. With this aid a series of ticks or letters recorded items ranging from crenellated parapets to chained Bibles which could then be recalled to mind at the end of the tour. This device might well be adapted to serve the needs of teachers who perambulate the Publishers' Exhibition at the Annual Conference of the Geographical Association in search of suitable replacements for the out-of-date stock which lumbers the geography shelves. A handful of ticks and crosses against the relevant entries on a prepared chart would rapidly register the outstanding features of new school books; thus in addition to the essential details of title, author, publisher, date and price, one could record in an instant the age and grade of pupil for whom the book is suitable, and note whether it contains maps, diagrams, photographs, exercises or index.

Faced with the formidable task of surveying, as concisely as possible, more than eighty different books for schools which have been sent to this Association for review, one is tempted to reduce the main features of each volume to a series of symbols, after the style of Edmund Vale's dumb-verger. Abbreviations tend to be tedious, however, and it would seem preferable to group these books into four main categories:

1. Textbooks
2. Supplementary Texts and Readers
3. Library and Reference Books
4. Texts written for children in other countries

These in turn are capable of further sub-division according to the age of pupil for whom each book appears suitable:—

(a) 8 to 11 years, i.e. for primary schools.

(b) 11 to 14 years, i.e. for lower forms in secondary schools.

(c) 14 to 16 years, i.e. for upper forms in secondary schools, to Ordinary level.

(d) Over 16 years, i.e. for Sixth forms.

There is inevitably some measure of overlap between these categories and age-groups, but they offer a rough guide to the contents of each book.

1. TEXTBOOKS. In this category are included books suitable for purchase in class sets, i.e. one per pupil.

(a) *Geography Picture Books*, Easy Study Edition, edited by G. Noyle, Macmillan, 1959, 3s. 6d. each, are four in number, and all deal very simply with facts of economic geography. There is a coloured picture on the upper half of each page, thirty in each book, and an explanatory caption written for younger and slower readers. *Let's Look Around*, book 1, by R. J. Candy, 40 pp., 1960, 5s., is also published by Macmillan; in title and contents it closely resembles *Looking Around* by A. H. T. Glover and I. V.

Young, 64 pp., 1960, 5s. in limp covers, which is book 1 of the *New Primary Geography Series*, issued by the University of London Press. Both of these are introductions to practical geography and contain drawings and maps. The latter also has numerous photographs. A. and C. Black's *New Graded Geographies* are now issued in a revised version. The four titles in this series are: *Other Children's Homes*, 108 pp., 4s. 3d., *The Wonderland of Common Things*, 124 pp., 4s. 6d., *World Journeys by Land, Sea and Air*, 144 pp., 5s., and *Life and Work in Britain*, 144 pp., 5s. The first three are suitable for the primary school, but the style of the fourth is more fitted to the early years of a modern school. All four contain colour plates and photographs on glossy pages. *Pathfinding and Pathmaking* by Olive Garnett, 166 pp., Blackwell, 1959, 7s. 6d., is the fourth and final book in the series of *Discovery Books*. Here Miss Garnett introduces fundamental ideas of world geography through the story of travel and transport, and the book is well illustrated.

(b) The first seven books in this group are all approximately 10 by 7½ inches in page-size. *Looking at Britain* by J. and D. Gadsby, 96 pp., 1959, 5s. 6d., and *Looking at the World Today*, by J. and D. Gadsby and G. M. Ashby, 112 pp., 1960, 6s., are books 3 and 4 of the series *Looking at Geography* edited by R. J. Unstead for A. and C. Black. Printed on good quality paper with bold maps and clear photographs (some in colour), these books will appeal to younger modern school pupils who prefer a pictorial approach. B. G. Hardingham has written the first three volumes of a series published by Nelson entitled *This Land of Britain: a social geography* published in 1960. Each book of 136 pages costs 9s. and is well illustrated: book 1 is called *Living Together*, book 2 *Working Together* and book 3 *Britain and the World*. Allan Murray has compiled two sketch-map books for Collins in which vivid colours are used to enliven the maps: *The British Isles—where, how and why*, 64+xvi pp., 1958, 5s. 6d. and *Our Changing Commonwealth—where, how and why*, 96+xxxii pp., 1960, 7s. 6d. Both contain lists of things to talk about, to find out, and do, based on the maps. *People in Britain*, by Eric Young, 192 pp., 1960, 8s. 6d., is the first book in a *Course of World Geography* by E. W. Young and J. H. Lowry, published by Arnold, which is designed to cover the "O" level course in five volumes. This introductory volume develops the sample study approach and presents geographical facts chiefly in the form of maps, diagrams and photographs. Another "book one" to appear in 1960 was *Man's Environment* by Professor W. G. East and Miss C. M. Barrett, 220 pp., 10s. 6d., which offers a more academic approach to the "O" level course covered by the remaining nine volumes of Nelsons' *Geography Texts*. Two books suitable for the middle forms of grammar schools are *North and South America* by J. Stembridge, 148 pp., Oxford University Press, 1960, 8s. 6d., and *North America, Europe and the British Isles* by J. S. Hobbs, 224 pp., English Universities Press, 1960, 9s. 6d.; the latter being the third of five volumes which make up the *General School Geography*.

(c) *The British Isles* by J. H. Lowry, 288 pp., 1960, 12s., is book 4 of the *Course in World Geography* published by Arnold, mentioned above, whilst *the British Isles* by J. A. Morris, 278 pp., 1960, 12s. 6d., is number 8 of the *Geography Texts* issued by Nelson. *Modern Geographies* by T. Herdman and A. Hurworth, 660 pp., Longmans, 1959, 18s., is a one-volume complete edition of three books which were reviewed in this journal in 1958. New

impressions appeared in 1960 of Allan Murray's Study Map Note Books: *The British Isles*, 128 pp., 5s., and *The New Europe*, 96 pp., 4s. 6d., both published by Collins. Sketch-maps occupy each left-hand page, with closely packed notes on the right-hand pages. A new series to appear in 1960 was Bell's *Concise Geographies*, written by A. W. Rayns. Three of these books are: *The Southern Continents*, 96 pp., 6s. 6d.; *North America*, 64 pp., 5s., and *Asia, excluding the Soviet Union*, 80 pp., 6s. Crown Quarto in size, each book has maps and small photographs on almost every page, the text being, in effect, a series of paragraphs and questions which comment upon the numerous illustrations.

(d) *The Americas* by L. Dudley Stamp, 274 pp., Longmans, 1959, 17s. 6d., is the 9th edition of a now familiar volume in his *Regional Geography for Advanced and Scholarship Courses.* New sections dealing with Polar regions and the power of the North American countries in the world have been added. The same continent is given more detailed treatment in two new texts which have been written specially for sixth-form work: *North America, a regional geography* by J. H. Paterson, xvi+454 pp., Oxford University Press, 1960, 37s. 6d., and *Latin America, a regional geography* by G. J. Butland, 373 pp., Longmans, 1960, 27s. 6d. The latter is the first of a new series of texts for sixth forms under the editorship of Professor R. W. Steel. Two more volumes for Advanced level work have been issued in 1960, both dealing with the borderlands lying between Europe and Africa: *The Mediterranean Lands* by D. S. Walker, xxiv+534 pp., Methuen, 1960, 42s., and *The Mediterranean Lands* by Harry Robinson, 468 pp., University Tutorial Press (Advanced Level Geography Series), 1960, 21s. Heinemann have recently issued (1961) *The British Isles* by G. H. Dury, xiv+503 pp., 30s.—a completely new textbook. Finally in this section, there is a new volume in the series *A Systematic Regional Geography*, edited by J. F. Unstead; *Australia, New Zealand and the Southwest Pacific*, by K. W. Robinson, 340 pp., University of London Press, 1960, 25s. In this same series, a fifth edition of *The British Isles* by J. F. Unstead was also published in 1960, price 18s. A fuller appreciation of these new texts for sixth-form work will be given in a subsequent number of this journal.

2. SUPPLEMENTARY TEXTS AND READERS. This category includes books which are suitable for purchase in class sets; they may be inexpensive background books for younger children, or texts dealing with a specific topic of the syllabus in secondary schools.

(a) Oxford University Press have issued more titles in their *People of the World* series, amongst them being *A Sugar Plantation in Jamaica*, *The Cattle People of Nigeria*, and *The Coconut Lands of Southern India*, all by different authors who have intimate knowledge of the areas about which they write. Each 32-page booklet consists of a story with black and white drawings and is suitable for use with children aged 9 to 11. A library edition, priced 9s. 6d., brings together six of these booklets, and there are series I to III covering 18 booklets in all. From the same publishers come *The Amazon* and *The Murray*, the first two titles in a companion series called *Rivers of the World*, also 32 pages at 2s. each. An earlier series of booklets, *Animals of the World* is also available in library editions as well as in separate booklets, priced at 7s. 6d. each. Macmillan's *Sea Story Readers* by Andrew Wood

include *North Sea Children*, 62 pp., 1955, 2s. There are exercises on the contents of each chapter at the end.

(b) and (c) *How to use an atlas* by L. F. Hobley and G. R. Davies, 136 pp., Blackie and Son, 1960, 4s. 9d. (with answers), is a pocket-size booklet which gives dozens of questions to test the pupil's ability to use an atlas. Notes and explanatory drawings assist the pupil to work independently. The copy without answers costs 4s. 3d. *How we work together*, devised by Paul Redmayne, 24 pp., Philip, 1960, 2s. 9d., is one of Philips' Pictorial Booklets which give information on topics suitable for civics or social studies, by means of text and drawings. In 1960 Longmans published Unit 20 of their *Colour Geographies*, entitled *Industrial Neighbours*, 40 pp., 3s. Numerous photographs and diagrams, several in colour, deal with manufacturing in European countries. *A Contour Dictionary* by J. B. Goodson and J. A. Morris, 64 pp., Harrap, 1960, 7s. 6d., is the third edition, revised and enlarged, of a well-known aid to map-work which was first published in 1945. It includes examples of the O.S. 1 : 25,000 map and of the Seventh Series One-inch map. *First Lessons in Physical Geography* by G. H. C. Waters, 148 pp., Longmans, 1957, 4s. 6d., is a pocket-size booklet which deals with world land-forms, climate and vegetation by means of text and drawings. *North America* by B. Ferris, 48 pp., Hulton Educational Publications, 1960, 4s. 6d., is one of the *Revision Outlines of Geography*. Detailed sketch-maps on the right-hand pages are accompanied by notes and exercises on the facing pages. *An Atlas Notebook of Scotland* by G. Rae, 48 pp., University of London Press, 1960, 4s. 3d., is a series of blank-map exercises designed to supplement atlas information.

(d) *A Study Guide in Physical Geography* by F. J. Monkhouse, 96 pp., University of London Press, 1958, 3s. 9d., is a little booklet to help sixth-formers who are working through their course on their own. It could be used along with the bulkier *Principles of Physical Geography* by the same author. *An Introduction to Mapwork and Practical Geography* by John Bygott, revised by D. C. Money, 264 pp., University Tutorial Press, 1960, 17s., is the seventh edition of a well-known book first published in 1934.

3. LIBRARY AND REFERENCE BOOKS. These books provide background information to supplement geography lessons, but are in general too expensive or too restricted in scope to be purchased in class sets, i.e. one per pupil, except where classes are very small. Hence they are likely to be suitable for the school library or for the reference shelves in the geography room.

(b) and (c) *Wool*, 148 pp., Longmans, 1959, 12s. 6d., deals with the rearing of sheep, world production of raw wool, and the trade movements of this commodity. Numerous clear photographs, coloured graphs and circle diagrams supplement the text to make this an attractive booklet. *Lands of the Commonwealth* by R. K. and M. I. R. Polkinghorne, 220 pp., Harrap, 1960, 10s. 6d., portrays life, work and landscape of different territories; there are many photographs and some maps. *The Commonwealth We Live In*, 64 pp., H.M.S.O., 1960, 2s. 6d., dwells more on the recent history of Commonwealth countries. With over twenty photographs in vivid colour, this is good value for half-a-crown. *Life Before Man: the story*

of fossils by Duncan Forbes, 64 pp., Black, 1960, 8s. 6d., has numerous clear photographs to accompany the text. *The Study Book of the Land*, by Ronald S. Barker, 48 pp., The Bodley Head, 1960, 8s. 6d., is slightly smaller in size than the previous book, but tells a similar story, using drawings and sketches in lieu of photographs. Yet another book on the earth's crust is *Half Hours with Geology* by Herbert McKay, 140 pp., Oxford University Press, 1960, 8s. 6d., one of a series written by the same author, called *New Playbooks of Science*. Three titles in a new series called *Adventures in Geography*, edited by Nina Gardner, have been published late in 1960 by Muller: *With Gordon in the Sudan*, by Ann Tibble, *With Colonel Fawcett in the Amazon Basin* by Harry Williams and *With Peter Fleming in Tartary* by Garry Hogg. Each has 144 pages and costs 9s. 6d. The aim is to describe the journeys of famous explorers in a style suitable for children aged 12–15 years and to give an impression of the geography of the countries traversed. Line-drawings and photographs accompany the text and there is a map as frontispiece. *People of the Sun* by Richard Ogle, 116 pp., Pitman, 1955, 8s. 6d., describes the peoples of Africa south of the Zambezi. *Adventure Today*, edited by E. W. Parker, 182 pp., Longmans, 1955, 3s. 6d., is one of the *Heritage of Literature* series, and contains extracts from the writings of Jim Corbett, Alain Bombard, Hans Hass and others. *The Polar Explorer* by E. W. Kevin Walton, 90 pp., Educational Supply Association, 1960, 7s. 6d., is one of a series of Information Books on *People's Jobs* and has numerous photographs and diagrams to supplement the text. In *The Changing Shape of Things* series edited by Paul Redmayne, two revised titles are *Transport by Air*, 1959, and *Transport by Land*, 1960, both by T. Insull, 48 pp., Murray, 15s.

4. TEXTS WRITTEN FOR CHILDREN IN OTHER COUNTRIES. A number of books sent to the Association for review are intended for use in schools outside Britain. In general they are not likely to be adopted as textbooks here, for obvious reasons, yet they may contain detail about parts of the world which give them value as reference or library books for use by children of varied ages and grades in Britain.

The Whipple and James Basal Geographies are a series of five books published by the Macmillan Company of New York for American schools. Written by Gertrude Whipple and Preston E. James, these books, which revise an earlier edition, present the facts of world geography in a lively and lavish manner. Stoutly bound and printed on quality paper, each volume employs coloured photographs and maps to augment the black and white examples. *Our Changing Earth*, 318 pp., 1954, 27s. 6d., is an elementary survey for 9-year-olds, whilst the remaining four volumes, each $10 \times 7\frac{1}{2}$ inches, are intended for use with children aged 10 to 14; *Living on Our Earth*, 254 pp., 1955, 32s. 3d., offers a number of regional studies; *At Home on Our Earth*, 350 pp., 1955, 33s. 3d., deals with the United States and British Commonwealth; *Neighbors on our Earth*, 346 pp., 1955, 33s. 9d., covers Latin America and the Mediterranean regions, whilst *Our Earth and Man*, 412 pp., 1955, 34s. 6d., treats of Eurasia before concluding with world studies of human geography.

Longmans *Tropical Library, Geography Series* now contains book 3, *Our Rivers* and book 4, *Our Ocean*, both by Gwen Cross, 80 pp., 1960, 2s. 8d.

each. These slim volumes have a simple text accompanied by black and white drawings and could be read by children in the primary school. *Elementary Map Interpretation* by J. H. Jennings, 62 pp., Cambridge University Press, 1960, 8s. 6d., is based on maps of Nigeria, Ghana and Sierra Leone. *A sketch-map atlas of Nigeria* by H. O. N. Oboli, 48 pp., Harrap, 1960, 4s. 6d., intended for secondary schools in Nigeria, has many bold black and white maps of the country which would aid fifth and sixth formers in Britain. In *A Geography of Western Nigeria*, 95 pp., Cambridge University Press, 1960, 4s. 6d., James Grant has written a lively text (with many illustrations) concentrating first on Ibadan and then on districts of Western Nigeria. Primary school teachers and training colleges in Britain would find it a useful source of material and illustration. Three other books on West Africa, all from the University of London Press, contain enough detail to interest sixth-formers who are studying the continent:—*A Ghana Geography* by D. T. Adams, 194 pp., 1960, 6s., is a revised edition of a book published ten years ago; *West Africa, a school certificate geography*, by C. A. Ackah, 208 pp., 1958, 3s., and *A Short Geography of West Africa* by J. C. Pugh and A. E. Perry, 290 pp., 1960, 9s. 6d. The same publishers also issued in 1960 *Looking at the World* by A. J. F. West and J. Rose, 96 pp., 5s. 6d. This is a large exercise book for Malayan children which describes farming conditions in different parts of the world; the pages contain spaces for answers and blank rectangles for pupils to fill with commodity labels. *From Jungles to Snowlands*, by J. H. Shaw and F. G. Kirkwood, 120 pp., Shakespeare Head Press, Sydney, 1958, is a book of climatic studies for junior pupils in Australian secondary schools which could be used as a reference book for older pupils in Britain. Finally, *La Région Parisienne*, by P. George and P. Randet, 160 pp., Paris, Presses Universitaires de France, 1959, 1500 fr., is a book to be dipped into by the sixth-former who knows some French; coloured maps and several black and white photographs assist comprehension of the lengthy text.

A collective review of geography books for schools which appeared in this journal three years ago, indicated certain post-war trends which were becoming apparent in this type of educational literature. These trends have since been maintained, and to them might be added three new tendencies in this limited field; first, there are signs of a growing preference for sample studies to form the basis of the first year's work in the secondary school course. Next, there has been a sudden, and most welcome, blossoming of regional textbooks written specifically for the sixth-former who is preparing for the Advanced level of the G.C.E. Volumes of this calibre are bridging a gap which has long existed between texts catering for the Ordinary level and the bulky literature of the university researchers. The third trend is one which it is hoped will spread to all levels of school geography books; this is the increasing use of colour in photographs, maps and diagrams which until recently were invariably in black and white. Recognition of the greater potentialities of colour for geographical demonstration has hitherto been more widespread among the producers of books in other countries. Hence it is pleasing to observe that British firms are beginning to employ colour in their textbooks without unduly inflating the retail price.

The Geographical Association

ANNUAL REPORT 1960

It was with profound sorrow that we learned, early in the year, of the sudden death of Mr. G. J. Cons, which robbed the Association of its President-elect, and an opportunity to honour one who had done much for the teaching of our subject. In recent years within the Association he had played a very active part in the work of the Standing Committee for Visual (now Teaching) Aids. In all spheres he will be sorely missed.

At the Spring meeting of Council, Mr. Geoffrey Hutchings was elected to take office as President in 1961. This will be the first occasion when we shall welcome as our President a distinguished field geographer and teacher—probably known to hundreds of our members through his long and outstanding work for the Field Studies Council, particularly as Warden and geographer at Juniper Hall. To the retiring President, Professor Austin Miller, we express warmest thanks for his work and his attention to the Association's business during an exceptionally busy year.

In his Annual Report for 1912 the then Honorary Secretary happily recorded that membership during that year had just passed 1000. It is my pleasant duty to report that membership has now firmly expanded fivefold beyond this; at the close of the financial year it was 5110 (including 729 students), as compared with 4919 (889 students) in 1959.

The present year has been associated in very marked degree with an expansion in the scope of those many activities that continually remind your officers and the members of your executive committee (if not individual members) of the Association's ever-advancing national educational stature and international prestige. These activities have, for example, ranged over such fields as discussions, through the Ministry's representative, with Local Education Authorities on matters concerned with field studies and the vexed question of financial aid; the nomination of representatives for the Ministry's Secondary Schools Examination Panel; discussions with various examining bodies regarding G.C.E. questions and syllabuses; correspondence at a high level, regarding the status of our subject in the proposed new universities and the desirability of the creation elsewhere of further chairs in the subject; attempts to arrange a fourth international conference abroad of teachers of geography; the institution, through the Imperial Relations Trustees, of Commonwealth Travel Bursaries for teachers of geography.

Further, a committee has been deeply engaged in an important investigation as to the nature and extent of overlap in sixth-form school and first-year university teaching in our subject, and a report on this work will be published in due course. A drafting committee has worked very hard on the exacting and long overdue revision of our constitution. We hope that the proposed new Statutes and Standing Orders will be generally approved. These revisions have been referred to Lord Nathan, a former President, to whom we are deeply indebted for his kindness in agreeing to act as honorary legal adviser to the Association.

In other directions the work of our editorial board expands steadily, and the problem of the distribution of our now numerous publications becomes acute. Within our restricted offices, arrangements must be made for the distribution of some 22,840 issues of *Geography* each year; in addition, mainly in lots of one or two copies at a time, nearly 5000 copies of the first two booklets in the series "British Landscapes through Maps" were sold by post through headquarters within a few months of publication. Sales of other publications likewise exceeded 14,590 during the year. These figures are a measure of the magnitude of the needs we serve no less than of the labours involved. To these, however, must be added the day-to-day correspondence,

measured again through the year by thousands of letters and enquiries, and, further, the handling of arrangements for our conferences and summer schools at home and abroad, and all of these activities are additional to routine membership and business matters.

Our very small staff works with real devotion on our account and there is urgent need for increased help and remuneration. The proposed introduction of the new subscription next September (we hope at very little extra cost to members who can claim tax relief on subscription payments) will ease our present needs. We hope to increase the size of our journal, and to make our headquarters staffing arrangements more effective in helping forward the work not only of individual members but also of branches and of Section and other committees. Furthermore, by September 1961, we may find that we must make a substantial financial outlay towards the making of a new home for our Library and Headquarters.

We are undismayed by the evidence of vigour and dynamic growth that beset us on every hand at headquarters, for these are an index of the current changing values of many facets of education and of a new standard of recognition, particularly in higher educational spheres. We, within the Association, must both seek and rise toward new opportunities that should be presenting themselves in a changing national view, for complacency would spell decadence.

Outside headquarters, branches present important key points whence growth is engendered and developed, and the officers and committees of local branches, from many of which interesting reports have been received, are to be congratulated on the variety and interest of their local programmes. Several branches report difficulties consequent upon falling membership despite the overall growth of the Association's membership. Several new branches have been formed, and to these, as to those well-established, your officers send good wishes and warm thanks for the hard work that is undertaken often against many difficulties. We ask all branches to review their composition and administration against the constitutional requirements as set out in the proposed revision of the Statutes and Standing Orders.

During the year two valuable conferences were held. The first was the customary Annual Conference, which this year was noteworthy and surpassed all previous records in the numbers who attended. The persistent growth in the size of this meeting in recent years is a matter much exercising the minds of your officers. There are few if any other buildings in the heart of London that could offer as extensive accommodation for our lectures and exhibitions, and none at so nominal a cost; and we are greatly indebted to the Council of the London School of Economics for the facilities that we have for so long enjoyed each year for this meeting. The spring meeting was greatly appreciated by a large gathering of members who were able to absorb some of the spirit and personality of the historic city of Durham and of its local region. To our indefatigable conference organizers in both London and Durham our warmest thanks are due. This year saw no development of a foreign summer school since the meetings of the I.G.U. at Stockholm attracted many members. A very hard working small group of field workers, however, attended a stimulating course and enjoyed the hospitality of the new field centre at Slapton in South Devon, and we are grateful to the members of the staffs of Sheffield and Exeter University departments of geography who organized the work so successfully.

The work of our several standing committees and section committees thrives greatly, and to the respective Section committee officers a very warm vote of thanks is due.

The Secondary Schools Section reports a variety of lines of thought and activity, concerned with discussions amongst its members relating to school and examination boards' syllabuses, field study grants, the post-school employment of geography pupils, and other matters.

A memorandum on the N.U.J.M.B. syllabus is being prepared following considerable discussion and correspondence during the year. Under the editorship of

Mr. Nicholls, booklets of exercises on the O.S. Lake District Tourist Map and the One-inch Wensleydale sheet have been prepared for publication.

The Primary Schools Section has been concerned with the problems incurred in the organization of school journeys, particularly with younger juniors and in small schools where there is a wide range of age and intelligence. Much study has been attempted of the place of geography in the Infant school. The committee has collected samples of work carried out in such schools by its members. The variety of topics and of methods that can be used in the Infant school as a basis for work in any school at a later age was seen to be of great interest and value. Study has been made also of the understanding by very young children of many of the terms used in the physical basis of the subject; where there are books in the home, the vocabulary of seven year olds can be quite extensive. It is to be hoped that further work will be undertaken and a report prepared in this important and basic field of geographical education.

The Public and Preparatory Schools Section reports a year within which two very good issues of the Section's journal "Notes and Queries" have been circulated. These include articles for teachers on such topics as project in geography teaching; recent developments in the subject; and the link between biology and geography. A disappointingly small number of essays was entered for the Steers Prize Competition. Copies of this section's journal may be borrowed by members of other Sections who are interested.

The Training Colleges Section has held its customary three short conferences during the year. The first of these—a special occasion—was a very well attended conference on Teaching Geography in Junior Schools. Consideration was given to the Association's publication under that title and to the relevant Section of H.M.S.O. publication *Primary Education.* The conference proved to be very successful. A second, weekend, conference was held at Salisbury by kind invitation of the Principal of the Diocesan Training College. This meeting included a number of valuable local field excursions. The theme of the conference was Map work and the Use of Map work in schools. The autumn conference was related to the Changing Face of London.

The Further Education Section reports a welcome increase in activity during the year, though the committee is still anxious to recruit more members from Institutes of Further Education of all kinds. Many teachers in such institutions still seem to be unaware of the existence of the Section. The Section Committee has met three times and held a weekend course at Salisbury attended by fifteen members. This gave rise to a fruitful series of discussions leading to enquiries into the role played by part-time Day Release Courses and an examination of the function and kind of geography desirable in Further Education when the subject is not studied for examinations. It is hoped to prepare a report on the former enquiry.

The Field Studies Standing Committee has been active in supplying information on centres, methods of field study, and bibliographic information in reply to numerous enquiries. It has also organized summer schools and courses.

The Teaching Aids Standing Committee reports work progressing on the preparation of a pamphlet on the Use of Teaching Aids in Geography and specific plans are being made to consider the use of television in schools, amongst other activities.

The Library continues to grow and to serve the widening needs of many members. To our Librarian, Mr. L. J. Jay, a warm tribute of thanks is long overdue for the great amount of time he most generously gives to its needs and to other work at headquarters which he undertakes, arising from library enquiries.

For the most part, however, it is quite impossible to express adequately and individually, our grateful thanks to the now very numerous members who work with such loyalty and enthusiasm on behalf of an Association whose growing strength year by year reflects the individual labours and support of countless numbers, now often of quite young members. They, in new and changing spheres, today carry forward the trust we inherit from the founders and fathers of our subject and of the

Association. Of four of the latter (of whom three are former Presidents, three are now Vice-Presidents and one a Trustee), we have news that many will wish to know. Mr. L. Brooks, known to many both personally and through his textbooks, has been seriously ill, and to him we send sincere wishes for his recovery and warm greetings; Professor J. F. Unstead, one of the Association's senior officers in 1906, still writes kindly letters of friendship to the Association from time to time though we now rarely meet him personally. To our very dear friends, Professor and Mrs. Fleure, known to so many personally in earlier decades, we extend special greetings in the year of their golden wedding anniversary; Professor Fleure, our chairman of Council, now in his 84th year still attends many of our meetings and greatly enriches these with the wise counsel he can give, as an elder statesman. To Mr. T. C. Warrington, who saw the very foundation of the Association at Oxford and who is now surely the veteran "father" of our membership, we send our warmest good wishes. Now in his 91st year, he has recently undergone a serious operation and our thoughts are much with him during anxious days.

ALICE GARNETT

December 1960 *Honorary Secretary*

THE GEOGRAPHICAL ASSOCIATION

BALANCE SHEET — **31st August, 1960**

	£ s. d.	£ s. d.	1959 £
ACCUMULATED FUND			
Balance at 31st August, 1959	1,259 5 7		1,133
Add Surplus for the year from Income and Expenditure Account	81 8 4		126
		1,340 13 11	1,259
GENERAL RESERVE			
Balance at 31st August, 1959	1,992 19 5		
Add Surplus from Study Courses and Conferences Account	43 16 0		
		2,036 15 5	1,993
REMOVAL RESERVE			
Balance at 31st August, 1959	800 0 0		
Add Transfer from Income and Expenditure Account	200 0 0		
		1,000 0 0	800
CURRENT LIABILITIES			
Subscriptions paid in advance	498 18 7		884
Geography (one issue)	815 12 5		672
Creditors and accrued expenses	604 16 3		1,560
Bank overdraft (unpresented cheques)	385 11 4		—
		2,304 18 7	3,116
		6,682 7 11	7,168
PUBLICATIONS RESERVE FUND			
Balance at 31st August, 1959	1,729 17 11		1,675
Add Interest for the year	73 1 4		54
Transfer from Income and Expenditure Account	800 0 0		—
		2,602 19 3	1,729
Carried forward		£9,285 7 2	£8,897

	£ s. d.	£ s. d.	£ s. d.	1959 £
ACCUMULATED FUND ASSETS				
FIXED ASSETS				
OFFICE AND LIBRARY FURNITURE AND EQUIPMENT				
At Book Value, 31st August, 1951, or subsequent cost		1,385 9 1		
Deduct Accumulated Depreciation ..		437 19 1		
			947 10 0	873
INVESTMENTS				
£200 3% Savings Bonds, 1965–75		200 0 0		200
£1,800 5% Defence Bonds		1,800 0 0		—
Cave Austin & Co. Ltd. 1,265 5% Preference Shares of £1 each, at cost		851 13 0		852
			2,851 13 0	1,052
(Market Value £2,654)				
CURRENT ASSETS				
Stock of Special Publications		584 13 2		364
Debtors and prepayments		1,139 0 7		612
Cash on deposit				
North Central Wagon and Finance Co. Ltd.	1,018 3 7			
Leek & Moorlands Building Society	110 15 6			
		1,128 19 1		3,552
Cash at bank and in hand		30 12 1		715
			2,883 4 11	5,243
			6,682 7 11	7,168
PUBLICATIONS RESERVE FUND ASSETS				
Duplicator, at cost, *less* depreciation		— — —		7
Cash on deposit				
North Central Wagon and Finance Co. Ltd.		2,600 0 0		1,667
Cash at bank		2 19 3		55
			2,602 19 3	1,729
Carried forward			£9,285 7 2	£8,897

	£	s.	d.	£	s.	d.	1959 £
Brought forward				9,285	7	2	8,897
LIFE MEMBERSHIP FUND							
Balance at 31st August, 1959	3,190	16	8				3,109
Add Subscriptions received in the year	312	8	6				81
				3,503	5	2	3,190
JUBILEE FUND							
Balance at 31st August, 1959	1,058	11	8				1,032
Add Interest for the year	31	3	6				27
				1,089	15	2	1,059
HERBERTSON MEMORIAL FUND							
Balance at 31st August, 1959	302	15	3				295
Add Interest for the year	8	16	3				8
	311	11	6				303
Deduct Expenses of Memorial Lecture	25	0	0				—
				286	11	6	303
				£14,164	19	0	£13,449

	£	s.	d.	£	s.	d.	£	s.	d.	1959 £
Brought forward							9,285	7	2	8,897
LIFE MEMBERSHIP FUND ASSETS										
INVESTMENTS										
£1,646. 4s. 2d. 3% Savings Bonds, 1965–75				1,646	4	2				1,646
£300 3% Savings Bonds, 1955–65				300	0	0				300
£170 Sale Corporation 5½% Mortgage Loan				170	0	0				170
Cave Austin & Co. Ltd. 985 5% Preference Shares of £1 each				755	4	7				755
(Market Value £2,165)				2,871	8	9				2,871
Cash on deposit										
North Central Wagon and Finance Co. Ltd.	631	16	5							
Leek & Moorlands Building Society	–	–	–							
				631	16	5				316
Cash at bank				–	–	–				3
							3,503	5	2	3,190
JUBILEE FUND ASSETS										
INVESTMENTS										
£820 3% Savings Bonds, 1965–75				820	0	0				820
£200 5% Defence Bonds				200	0	0				—
(Market Value £786)				1,020	0	0				820
Cash on deposit										
Leek & Moorlands Building Society				69	15	2				188
Cash at bank				–	–	–				51
							1,089	15	2	1,059
HERBERTSON MEMORIAL FUND ASSETS										
INVESTMENTS										
£250 3% Savings Bonds, 1965–75 (Market Value £178)				250	0	0				250
Cash on deposit										
Leek & Moorlands Building Society				36	11	6				38
Cash at bank				–	–	–				15
							286	11	6	303
							£14,164	19	0	£13,449

We have examined the above Balance Sheet, and annexed Income and Expenditure Accounts of the Geographical Association, and have obtained all the information and explanations which we considered necessary.

In our opinion the Balance Sheet and Income and Expenditure Accounts, which are in agreement with the books of account, show respectively a true and fair view of the state of the Association's affairs at 31st August, 1960, and of the Surplus for the year ended on that date.

Sheffield, 1*st November*, 1960.

(*Signed*) HOLMES, WIDLAKE & GIBSON
Chartered Accountants
L. DUDLEY STAMP
Honorary Treasurer

THE GEOGRAPHICAL ASSOCIATION

INCOME AND EXPENDITURE ACCOUNT for the year ended 31st August, 1960

Dr.

	£ s. d.	£ s. d.	£ s. d.	1959 £
Geography				
Printing and publishing		2,773 8 8		2,382
Blocks	135 11 7			
Less Authors' contributions	78 2 3	57 9 4		45
Postage and despatch		365 7 9		559
			3,196 5 9	2,986
SPECIAL PUBLICATIONS				
Stock at 31st August, 1959		364 9 2		263
Printing		1,044 5 11		288
		1,408 15 1		551
Less Stock at 31st August, 1960		584 13 2		364
			824 1 11	187
Repairs and renewals		52 1 3		
Insurance		29 16 6		23
Library and Office alterations		28 4 10		167
Depreciation of furniture and equipment		108 16 6		90
			218 19 1	280
Salaries and National Insurance		2,547 11 5		1,943
Staff superannuation		100 0 0		90
Printing and stationery		473 17 1		236
Telephone		50 17 0		39
Postage		323 4 11		296
Library expenses		111 19 5		55
Publicity		45 1 3		43
Bank charges		17 18 0		21
Accountancy		63 0 0		63
General office expenses		19 14 9		28
			3,753 3 10	2,814
Officers' and Standing Committees' expenses		214 14 3		123
Subventions to Branches		65 0 0		49
Special Sectional activities		26 10 11		17
			306 5 2	189
Transfer to Removal Reserve		200 0 0		800
,, ,, Publications Reserve Fund		800 0 0		—
			1,000 0 0	800
			9,298 15 9	7,256
Surplus for the year, being excess of Income over Expenditure, carried to Accumulated Fund			81 8 4	126
			£9,380 4 1	£7,382

Cr.

	£ s. d.	£ s. d.	1959 £
Sales of Publications	583 4 2		565
,, ,, Special Publications	2,087 5 2		669
Advertisements	723 18 6		838
		3,394 7 10	2,072
SUBSCRIPTIONS			
Current	4,777 16 5		4,324
Arrears	8 10 6		16
Income Tax recovered on Covenanted Subscriptions	372 2 0		142
		5,158 8 11	4,482
INTEREST RECEIVED—LIFE MEMBERSHIP AND ACCUMULATED FUNDS			
Government Stocks	137 18 10		65
Corporation Mortgage	9 7 0		1
Preference Dividends	112 10 0		113
Building Society interest	48 16 5		9
Deposit interest	113 4 1		66
		421 16 4	254
Donations		55 11 0	54
Sales of Library Books			95
STUDY COURSES AND CONFERENCES			
Amount allocated for administration expenses		350 0 0	425
		£9,380 4 1	£7,382

THE GEOGRAPHICAL ASSOCIATION

STUDY COURSES AND CONFERENCES—INCOME AND EXPENDITURE ACCOUNT for the year ended 31st August, 1960

Dr.

	£	s.	d.	£	s.	d.	1959 £
Expenses of Conferences and Courses				2,219	11	2	4,814
Transfer to General Income and Expenditure Account for administration	350	0	0				
Printing and postages, etc.	28	0	0				
				378	0	0	473
Excess of Income over Expenditure transferred to General Reserve				43	16	0	248
				£2,641	7	2	£5,535

Cr.

	£	s.	d.	1959 £
Income from Fees and Advertisements, etc.	2,641	7	2	5,535
	£2,641	7	2	£5,535

PRESIDENT AND PRESIDENT-ELECT

We have welcomed in office in January our new President, Mr. Geoffrey E. Hutchings, Senior Tutor in Geography of the Field Studies Council. The President-elect for the year 1962 is Professor E. G. Bowen, of the University College of Wales, Aberystwyth and a Trustee of the Association.

ELECTION OF MEMBERS OF COUNCIL

The following members were elected at the Annual General Meeting on 3rd January 1961 to serve on Council for the years 1961-63, replacing retiring members: Professor S. H. Beaver (University College of North Staffordshire), Mr. A. Jordan (Birmingham Branch), Mr. G. Newberry (Brighton Branch) and Mr. A. D. Nicholls (Secondary Schools Section Committee). Mr. T. H. Elkins (already serving on Council) and Professor Beaver were elected to serve on the Executive Committee.

AMENDMENTS TO STATUTES

The Annual General Meeting of 3rd January 1961 passed, on a second reading, alterations to Statutes 11, 12 and 18. These Statutes now read:

11. There shall be no entrance fee for membership of the Association and the Annual Subscription shall be £2 payable on the first day of September in each year. Members shall have the right to use (subject to regulations) the Association's library and any other loan collections; shall receive the Association's magazine and the notices of the Annual and other conferences; and shall enjoy such rights and privileges as the Council may from time to time determine.

The Council shall have power to admit *bona fide* students of educational institutions to membership of the Association at special rates which shall be determined by the Executive Committee.

12. At any time after joining the Association any member may commute all future annnual subscriptions by the payment of one sum of £40, which shall entitle him or her to Life Membership with all the rights and privileges of membership. No Life Member removed from the Association under Statute 10 shall have any claim upon the Association for any portion of the sum mentioned in this same Statute 12.

Members of not less than 20 years continuous full annual membership may compound for Life Membership, deducting 10s. for each year of full membership from the Life Membership Composition. Members of not less than 30 years continuous full annual membership may compound for Life Membership, deducting 15s. for each year of full membership from the Life Membership Composition. Members of 40 years continuous full annual membership may compound for Life Membership on a payment of £5.

Any person registered as a Life Member before January 1st 1948 may make use of the Association's library and loan collections upon payment of £1 per annum or of a single fee of £5 in addition to the Life Membership already paid (i.e. prior to that date).

18. These Statutes shall be alterable only by a majority vote at an Annual General Meeting called as prescribed in Statute 13.

PROPOSED REVISION OF STATUTES AND STANDING ORDERS

The Annual General Meeting of 3rd January 1961 approved in general terms the draft of the revised Statutes and Standing Orders which was put before all members of the Association last November. Further revisions were recommended and it was agreed that the advice of the honorary legal adviser of the Association should be sought upon the document. A further, and it is hoped final, draft acceptable to Council and members will be presented in due course.

NEW SUBSCRIPTION RATES

Following the alteration of Statute 11, mentioned above, members will have noted that the new annual subscription rate of £2 will come into force on 1st September 1961. Members who pay their subscriptions by Banker's Order have already received a request to use a new form supplied to them; we shall be very grateful for their prompt action in completing it and passing it to their banks as instruction to pay at the new rate.

Deeds of Covenant entered into to pay at the rate of £1 1s. per year cannot be altered, but on their expiry (after 7 years) a fresh deed can be signed at the new rate of subscription. Even though an existing Deed of Covenant covers an annual payment of only £1 1s., the new rate of subscription will be payable on and after 1st September 1961.

Members' attention is drawn to the new rates of Life Membership Compositions.

ANNUAL CONFERENCE, 2ND TO 5TH JANUARY 1961

The Annual Conference was held at the London School of Economics and was marked once again by very crowded meetings for a programme of lectures of exceptionally high academic quality and interest. Many were devoted to various aspects of climatology, from the President's address on Climate and the Geomorphic Cycle to lectures by Dr. G. B. Tucker and Mr. H. Lamb, both of the Meteorological Office, on Developments in Climatology during the last decade and on Climatic Change; by Professor G. Manley on Three Centuries of Snowfall in Britain, by Mr. M. J. Webb on Monsoons and Weather in South Asia, and by Professor A. H. Bunting on Agricultural Climatology in Tropical Africa; the Secondary Schools Section devoted time to a discussion on the teaching of meteorology and climatology in schools. A valuable day was also given to a splendid series of lectures on oversea geographical subjects including the Role of Kariba in a Changing Economy by Dr. M. M. Cole, Recent developments in the Sahara by Dr. J. I. Clarke and Dr. R. J. Harrison Church, and the New States of Southeast Asia by Professor C. A. Fisher. This last lecture was delivered at the House of the Royal Geographical Society whose Council once again extended hospitality to the Association, including tea to the numerous members attending this joint meeting, for all of which we extend warm thanks. A timely reminder of the importance that should be attached to Geography in Technical Education was given by Professor M. J. Wise in a stimulating address.

Apart from this valuable series of lectures the Conference was the scene continuously of crowded exhibitions of books, maps, teaching aids, visual aids and publishers' materials. It concluded with an active day of 5 field excursions greatly appreciated by those members who participated. The Annual Dinner was a well-attended, happy occasion, honoured by the presence of His Excellency the Ambassador for Japan and his wife, Mme. Ohno, amongst our guests.

It is impossible for us to express adequately our gratitude to and admiration of the two Conference Organizers, Mr. R. C. Honeybone and Dr. J. H. Bird, for all that they did to make this conference so very memorable. We are, once again, also immeasurably grateful to the Officers of the London School of Economics for the provision of accommodation on such generous terms. To them we extend a very warm vote of thanks.

A PLAQUE TO H. J. MACKINDER

The Lincoln Branch has had the happy thought of marking the centenary of the birth of Sir Halford Mackinder by the unveiling of a plaque to his memory at a school in Gainsborough, the town in which he was born and first educated. It is

planned to hold the unveiling ceremony, to be performed by Professor S. H. Beaver, President of the Branch, at Gainsborough in the early evening of Thursday 4th May.

SUMMER SCHOOL IN GERMANY 1961

Dr. E. M. Yates and Mr. T. H. Elkins (both of King's College, University of London) have plans for this course well under way. The first part of the course will be a study of the rural and industrial Ruhr district—which proved to be a very instructive part of a previous course held in Germany; the second part, of the Black Forest and Swabian Jura within reach of Tübingen, Wurttemberg. We have been promised accommodation (single rooms) in comfortable student hostels. The dates are 18th August to 2nd September, and the quoted charge is £55 (including air travel).

ANNUAL CONFERENCE 1962

The next Annual Conference will be held in London from January 2nd to 5th 1962. Members are asked to note these dates; programmes will be circulated to all members, without application, about the third week in November.

SPRING CONFERENCE 1962

The lateness of the dates of Easter next year have made it difficult to obtain suitable residential accommodation for the Spring Conference, but we are glad to announce that we have been able to accept an invitation to hold the meeting at the University College of North Staffordshire, Keele, under the direction of Professor S. H. Beaver. The provisional dates of the meeting will be 15th to 19th April—a departure from custom since they fall *before* Easter. The Honorary Secretary will be glad to know if these dates are likely to fall outside members' Easter vacations.

CORRECTION

On p. 317 of *Geography*, vol. xlv, November 1960, it was omitted that *The Langdales*, Occasional Papers no. 3, is published by the Durham Colleges in the University of Durham. The booklet can be purchased from there at Department of Geography, Science Laboratories, South Road, Durham.

On p. 291 of the same issue in the redrawing of Fig. 1(a) the symbols 2 and 3 were inadvertently transposed in position in the key. 2 should be + and 3 should be ▲.

APPOINTMENT

We record with pleasure the appointment of Dr. Emrys Jones, Reader in Social Geography at the London School of Economics, to the University Chair of Geography tenable at that School.

ORDNANCE SURVEY MAPS

Increases in the prices of O.S. maps as from 1st January 1961 have been announced. One-inch maps now cost 4s. 6d. (paper flat), 5s. 6d. (paper folded) and 7s. 6d. (mounted and folded). 1 : 25,000 maps cost 4s. (paper flat) and 5s. 6d. (paper folded). No change has been announced in the percentage discounts available to schools and others purchasing maps for educational purposes, for which appropriate requisition forms must be obtained from the Director, Ordnance Survey Office, Leatherhead Road, Chessington, Surrey.

Reviews of Books

With very rare exceptions books reviewed in this journal may be borrowed from the Library by full members and student library members of the Association.

Landscape Drawing. G. E. Hutchings. 23 × 14·5 cm. ix × 134 pp. London: Methuen & Co. Ltd. 1960. 30s.

The camera, it is said, cannot lie; it reproduces a landscape exactly as it is. Yes, but the photographer can choose his point of view falsely to prove his theory. On the other hand, the artist can alter the thickness of a line or the direction of his shading to support a wrong hypothesis of origin. But the interpretation of form is not Mr. Hutchings' present purpose; he teaches us to observe everything and to reproduce it faithfully and to the best of our ability. At the Field Study Centres where he has taught enthusiastically for so many years, you may study the art of landscape drawing either as it is or as your imagination distorts it. In this book he deals only with the former—as a geographer sees it. In simple language, without the obscure jargon of the artist, or even of the geographer, he tells you how to set out your drawing, how to measure distances, the steepness of slopes, the value of tone, light and shade, the principles of perspective and the representation of rocks, trees and houses. There are examples of the work done by Ruskin before the use of the camera, of sketches, mainly by climbers, of rock structure and texture, and some field sketches by the Editor of *Geography*, but most of the hundred illustrations are the beautiful and accurate work of the author himself. In simple but clear language he tells us how to avoid mistakes and how to annotate, to perfect and to date a drawing. The book ends with a welcome guide to the virtues and the use of artists' materials. The focusing of attention on every feature of the landscape, large or small, near or far away, is the best training the young geographer can have, and the subtleties of the features, thus faithfully recorded in his sketches, will awaken an interest in their explanation and stimulate their scientific study.

A. A. M.

The McGraw-Hill Illustrated World Geography. F. Debenham and W. A. Burns (Editors). 22 × 28·5 cm. xvi + 519 pp. London: McGraw-Hill Publishing Co. Ltd. 1960. 70s.

The outstanding features of this book are the numerous excellent black and white photographs and 31 pages of colour photographs. These alone would repay study by and give enjoyment to any intelligent secondary school pupil. The text is on the lines usually associated with encyclopaedias. After a general introduction on how to use the maps and an explanation of geographical terms, the continents are dealt with in turn. Within each continent the countries are dealt with in alphabetical order and this leads to considerable repetition, particularly in the description of, for instance, climate, for those political units which comprise West Africa.

Throughout the book the description of each country follows a set pattern—What to see (travel brochure type of information); physical features; climate and other formal geographical textbook sub-headings, as well as sections headed history, government and administration, religions, education and culture. For the strictly geographical topics the standard is G.C.E. 'O' level and has the virtue of being accurate in so far as it has been compiled by authorities on the different parts of the world.

For each country there is one sketch map (in a very few cases, two or three) showing the distribution of the major types of land use and mineral exploitation and resembling the notebook sketch maps of pupils in the middle forms of secondary schools. Some maps, of China for example, are on much too small a scale to be of

any appreciable value whilst others, e.g. United Kingdom, are too overcrowded and oversimplified. The value of the book would have been enhanced had more space been devoted to a greater variety of sketch maps on a larger scale even if it had meant sacrificing or reducing in size some of the photographs. A selection of maps from the Oxford School Atlas is incorporated as an appendix.

To sum up this is a book which is pictorially most attractive but whose usefulness would have been enhanced if a regional grouping of the political units within the continents had been adopted and if more and a greater variety of sketch maps had been used.

D. R.

Handbook for Geography Teachers. Prepared by the Standing Sub-Committee in Geography. General Editors: G. J. Cons and R. C. Honeybone. 13·5+20·5 cm. xv × 525 pp. London: Methuen & Co. Ltd. for the University of London Institute of Education. 4th edition, reset, 1960. 22s. 6d.

"Is there a list of geography books suitable for the school library—I have an allocation to spend before April?" "We are 'doing' the cement industry—where can I get visual aids for the lessons?" These are typical teachers' questions and the answers to them, and to many other problems of supply and ideas that beset geography teachers, are to be found, either directly or indirectly, in the *Handbook for Geography Teachers*. This *vade mecum* has a long history, having been edited first by Miss D. M. Forsaith in 1932; the present edition is an extensive revision of the 3rd edition published in 1957.

The pattern of the *Handbook* remains the same. The first 190 pages contain chapters on teaching topics, including suggestions for syllabuses in different types of schools and sources of materials—geography room equipment, maps, duplicators, projectors, visual aids. Revisions in these sections essentially cover changes or new developments during the past 5 years. Room dimensions that have become to some extent standardized in the recent school-building phase are discussed; and there is a strong plea for wall-space for the geography master's "pin-ups". An innovation is a list of foreign maps, which should encourage teachers who would like to use them for sample study, local study or other work, but who do not know where to obtain them.

The remainder of the book is given to classified book lists for primary stage, secondary stage, teachers and sixth forms, most entries having appraisals which would assist readers in the selection of books for special purposes. The inclusion of out-of-print titles should stimulate library use. In the section Geography in Literature, Exploration and Travel, which offers sources of readings to illustrate aspects of the geography of parts of the world, the entire arrangement of titles has been replanned—advantageously—but it would be worth keeping one's copy of the earlier edition for references that have been omitted this time. It has been made to include also, *in extenso*, the contents pages of *Splendour of the Earth*, a tribute both to Margaret Anderson and to all the authors from whose works she selected her anthology.

The editors' and publishers' headache in producing handbooks is the rapidity with which material goes out of date. For example, Ordnance Survey map prices have already been increased since section III was printed; and all the time, new books are coming out which could be added to the booklists. This in no way detracts from the usefulness of the *Handbook* for many years to come. All geography teachers should somehow acquire it or get access to it; teachers in training (at whatever level) should memorize its contents pages for future reference. It has no index: none is needed. Although the price of the book has jumped considerably, this reset, revised edition is larger in format and contains more pages and therefore more information. The Standing Sub-Committee in Geography of the London Institute of Education is to be thanked for continuing to share its collected knowledge and ideas with their geography-teaching colleagues elsewhere.

M. O.

Geomorphology. Geographies for Advanced Study. B. W. Sparks. 14·5 × 22·5 cm. xx + 371 pp. London: Longmans, Green & Co. Ltd. 1960. 37s. 6d.

This is a useful addition to textbooks of geomorphology, well produced and well illustrated, yet not too expensive. It covers the topics usually met with in one or two year courses at University level, using British examples wherever these are relevant. Two chapters provide a review of topics not always adequately covered in existing text-books, 'Erosion surfaces and their Interpretation' and a very useful chapter on 'The Effect of Rocks on Relief'. The photographs in the book are nearly all taken by the author and they are very good. However, more are needed from areas outside Great Britain; it is a little disconcerting to find a photograph of the Nant Ffrancon in a chapter on 'Pediments, Peneplains and Inselbergs'. The line diagrams tend to be over-simplified; for example the map of a diffluent glacier in the Karakoram (Fig. 170) is not at all clear (nor does the description in the text help very much), while Fig. 177 provides a wholly inadequate picture of the pro-glacial drainage of the North York Moors—it does not even show the Forge valley. No harm is done if a book reflects the particular interests of its author, and it is useful to have an eight-page account of Chalk landforms, with 14 references. Unfortunately this is at the expense of an equally important topic, the scenery of mountain limestone, which is dismissed in four pages—and more seriously is provided with only one reference. The style of the book is not always as precise as could be wished, and the rather long preambles to each chapter do not always provide the general introduction that is intended. The effect of this is well illustrated by the chapter on slopes, it is discursive and interesting, but one feels that more emphasis is needed on the particular rights and wrongs of the matter as Mr. Sparks sees them.

K. M. C.

The Geomorphology of Brecknock. T. M. Thomas. Reprinted from *Brycheiniog*, vol. 5, 1959, pp. 55–156. 19 × 25·5 cm. 1959. N.P.

This is a substantial, well-written and illustrated account of the geomorphology of the inland county of Brecknock. An outline of the geology is followed by a short geological history tracing the development of the landforms through to Cretaceous times. Following O. T. Jones it is suggested that traces of these early landscapes are still visible today. In particular it is believed that the higher portion of the Old Red Sandstone cuesta of Forest Fawr—Brecon Beacons—Black Mountains has survived, little modified, since Triassic times and unsubmerged even by Cretaceous deposits. The basis of this argument appears to rest solely upon a supposed resemblance between the Old Red Sandstone scarp and the rim of the South Wales coalfield. The latter is, following Strahan, taken to be pre-Triassic in age. It is highly unlikely that the Old Red Sandstone scarp became, at the close of the Trias, subject to a species of geomorphological suspended animation so that for 150 million years nothing has happened to it.

One of the most valuable sections deals with the relationships between structure and scenery. It is very competently illustrated by the author's field sketches. There is a long account of the Tertiary erosion surfaces in which much cartographically derived data on summit heights and spur flattenings is added to the field observations of Rice and others. This material is analysed by means of altimetric frequency curves and profiles of various types. The extent, altitudes and structural relationships of spur flattenings are depicted on two ingenious maps. It is postulated, with many previous authors, that the drainage was superimposed from a Cretaceous cover. The author favours the particular hypothesis of Jukes-Browne and Dewhirst that the crests on the Old Red Sandstone scarp were unsubmerged islands which became sub-centres of radially disposed streams on the upraised Cretaceous sea floor.

The influence of ice is described region by region. The impression given is one of disappointment that this region, so promising in prospect, proves to be much less so in close up. Landforms attributable to glacial deposition are few.

In the description of the karstic phenomena, particularly the sink holes on the Carboniferous Limestone and their remarkable if understandable occurrence on the overlying Basal Grit of the Millstone Grit, Mr. Thomas is a man writing with authority and enthusiasm. His description of solution subsidence outliers and the accompanying illustrations are excellent. Collapse in the Carboniferous Limestone transmitted through 250 feet of overlying Millstone Grit and its influence upon surface form are strikingly demonstrated. There is also an account of caves and underground rivers.

The final section deals with some post-glacial processes, gullying including peat erosion, landslips, terracing of valley fills and delta formation. There is no collective reference to peri-glacial phenomena.

Altogether a valuable contribution to the geomorphology of Wales, for teachers it is a storehouse of examples to be raided freely for classroom use and an indispensable guide to that field class in Brecknock. E. H. B.

Sahara. G. Gerster. 14·5 × 22·5 cm. viii + 302 pp. London: Barrie and Rockliff. 1960. 30s. **Tribes of the Sahara.** L. Cabot Briggs. 16 × 23·5 cm. xx + 295 pp. Cambridge, Mass.: Harvard University Press. London: Oxford University Press. 1960. 32s. 6d.

It is a pleasure to welcome two readable and informative additions to the small literature in English on the Sahara. Together they indicate many of the traditional and recent economic and social features. Unfortunately, both books deal with only a part of the great desert. Georg Gerster avowedly restricts himself to the fast diminishing French Sahara, and although Lloyd Cabot Briggs considers the Sahara between the Atlantic and the western frontier of Egypt he devotes most of his attention to the French Sahara. The eastern Sahara receives scant mention.

Georg Gerster, a Swiss journalist in the mould of John Gunther, has written a colourful series of essays on his recent travels (7,500 miles—one wonders about the relative value of mileage in different types of transport). He writes about dates, camels, cave art and nomads but is specially interested in the various problems of the new Sahara, of the exploration and exploitation of underground wealth and the resulting social transformations. Gerster manages, between anecdotes, to pack in a surprising amount of factual detail about platinum prospecting, pollen analysis of fossil manure, gas and oil pipelines, artificial rain, Saharan transport, solar energy, OCRS and many other topics. Moreover, he has a more detached view of the Sahara than most Frenchmen, who tend to regard it as their own desert. This admirable book is a useful purchase for a school library.

Dr. Briggs is an American anthropologist now resident in Algiers, who has already written about the prehistory and physical anthropology of Saharan peoples in *The Stone Age Races of Northwest Africa* (1955) and *The Living Races of the Sahara Desert* (1958). In this volume the author attempts a general description of the peoples of the Sahara, their history, environment and ways of life. History and environment, especially the latter, are summarily sketched and the bulk of the book is a social anthropology of the sedentary and nomadic inhabitants of the desert. Included are case studies of the Ahaggar Tuareg and Chaamba, both of whom have been studied in the field by Briggs, as well as of the Teda and the Moors. There are descriptions of the various tribal customs, dress, living quarters, health and disease, diets, and social and political systems, and although the studies may not entirely satisfy the specialist, they should certainly whet the appetite of the layman. It is a picture of the traditional tribal structure of the Sahara, but the author is well aware that this picture is rapidly disappearing. The book is responsible without being authoritative, and the geographer will wish for more reference to landscape and economy. J. I. C.

THE GEOGRAPHICAL ASSOCIATION 1961

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The authors alone are responsible for the opinions expressed in their articles.

Manuscripts are invited for consideration by the Editorial Board for publication in *Geography*; a leaflet of information for contributors can be obtained from the Honorary Editor. Articles of appropriate length are also invited for "This Changing World". Manuscripts submitted for publication and books for review should be addressed to the Honorary Editor, The Geographical Association, c/o The Park Branch Library, Duke Street, Sheffield 2.

Inquiries for advertisement space in *Geography* should be addressed to the Assistant Editor, The Geographical Association, c/o The Park Branch Library, Duke Street, Sheffield 2.